City Beautiful H_2O

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COMMUNITY GREENING PLAN

A GREEN STORMWATER INFRASTRUCTURE PLAN FOR HARRISBURG

NOVEMBER 2016

CAPITAL REGION™ WATER

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02 THE SOLUTION

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THE CITY AS A NETWORK OF GREEN INFRASTRUCTURE

The 1902 City Beautiful plan envisioned the "City as a Park." The Community Greening Plan takes this one step further by extending nature and bringing green stormwater strategies into streets, businesses, schools, public spaces, and more.

A GREEN VISION FOR HARRISBURG

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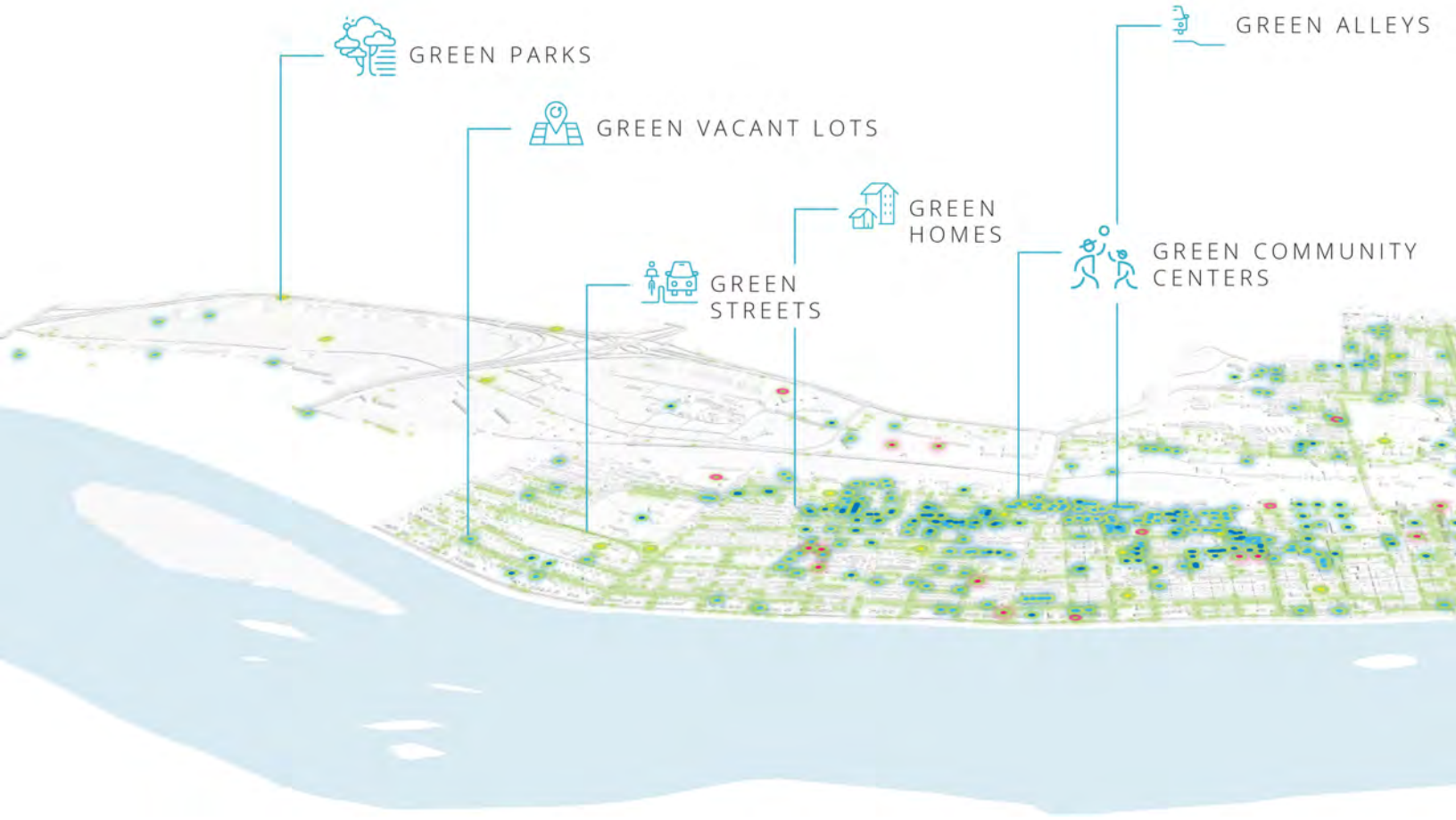
Imagine streets lined with trees and planters. Intersections that are narrower and easier to cross. Homes and businesses that can save money in the long term on utility costs. Schools that lead by example and provide hands-on learning about the environment. Parks with water features and gardens filled with native plants that foster community. A clean Paxton Creek and a Susquehanna River that gleams from the river steps. Now, imagine that this vision of greening the community could be achieved while also satisfying regulations that require managing stormwater and reducing flooding.



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As the operator of Harrisburg's drinking water, wastewater and stormwater systems with a mandate to reduce combined sewer overflows, Capital Region Water is in a unique position to positively impact the environmental health of the region and its water. Capital Region Water's commitment to improve the health of our watersheds, reduce the harmful effects of unmanaged stormwater, and beautify our neighborhoods, has ripple effects that extend beyond the provision of clean, safe water to our residents and businesses.

This Community Greening Plan, Capital Region Water's Green Stormwater Infrastructure Plan, focuses on identifying areas of opportunity for green infrastructure and assessing the feasibility of implementation in Harrisburg. While the main purpose of green infrastructure is to manage stormwater, the transformative nature cannot be ignored. Not only are the region's waterways poised to benefit from a green stormwater infrastructure master plan, but so are the residents, businesses, and visitors of Harrisburg. Green stormwater infrastructure has the ability to enhance placemaking, economic development, and can lead to the development of more memorable and enjoyable public space.

<

A NETWORK OF OPPORTUNITIES

This diagram depicts green infrastructure opportunities and community greening potential throughout Harrisburg. Each small project starts to add up and create a network of green infrastructure that manages stormwater, improves the health of our waterways, and enhances and beautifies our surroundings.

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THE PROBLEM

Credit: Flickr // Chesapeake Bay Program

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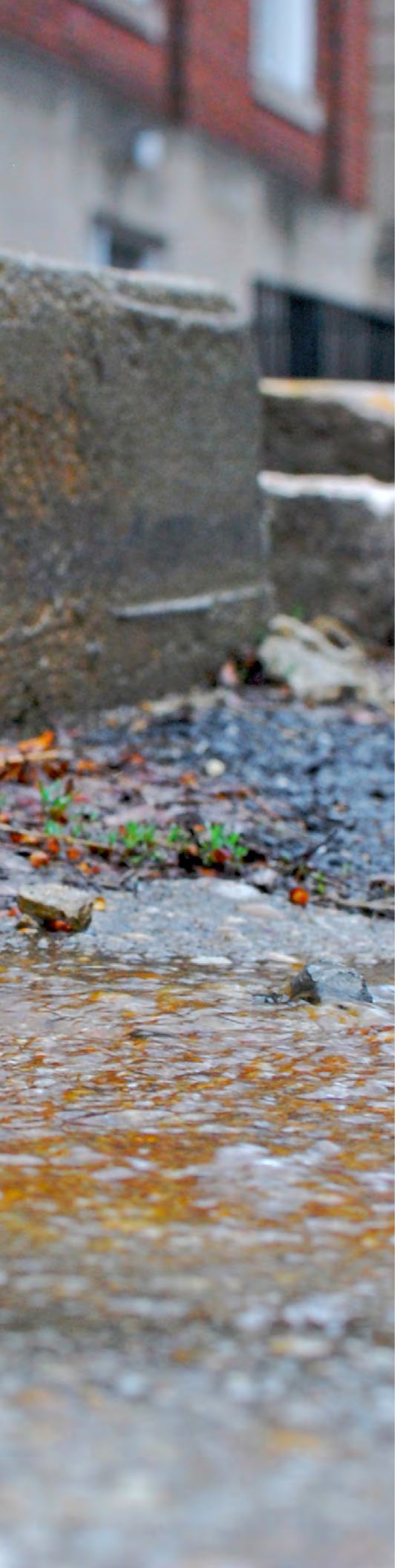
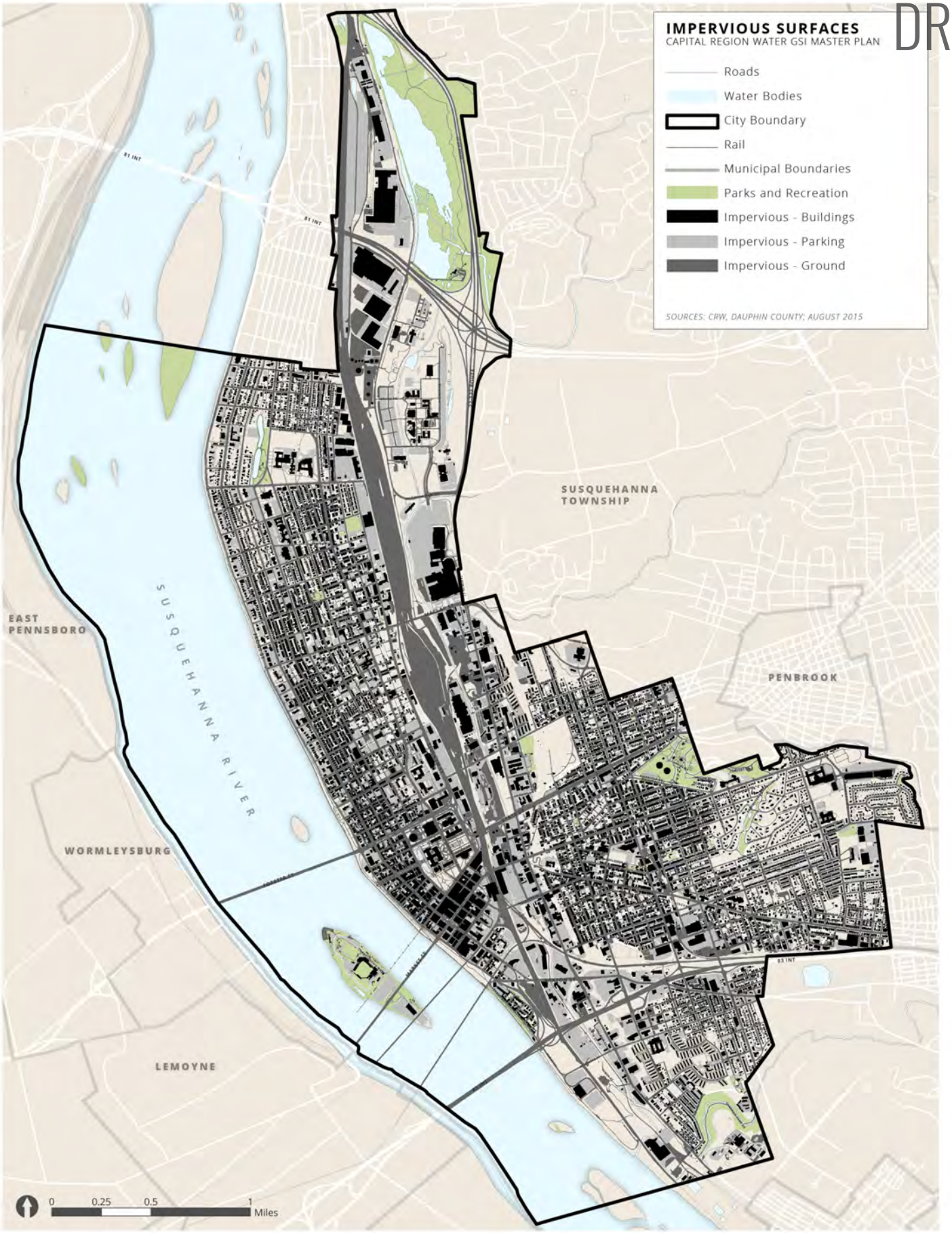


WHAT IS THE PROBLEM?

What is the problem? The simple answer is stormwater. Harrisburg, like cities across the country, is facing the challenge of upgrading and maintaining water and sewer infrastructure that was built decades ago. The city's infrastructure, a complex network of pipes, sewers, pumps, and waterways, is simply unable to handle the volume of water that enters the system during wet weather events. This means that when there is a moderate to severe wet weather event — rainfall or ice melt — the city experiences pockets of flooding caused by sewer backups. It can also lead to sewer backups in basements of homes and combined sewer overflows that carry pollution into waterways and threaten the health of the city's ecosystem. The effects of flooding, sewer backups, and combined sewer overflows are costly to clean up. These negative effects will only multiply as wet weather events become more severe and more frequent.

Capital Region Water, as part of a partial consent decree with the United States Department of Justice, is required to address water quality issues related to discharges from the combined sewer and municipal separate storm sewer systems that it manages.


IMPERVIOUS SURFACES
CAPITAL REGION WATER GSI MASTER PLAN
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Roads
Water Bodies
City Boundary
Rail
Municipal Boundaries
Parks and Recreation
Impervious - Buildings
Impervious - Parking
Impervious - Ground
SOURCES: CRW, DAUPHIN COUNTY; AUGUST 2015
SUSQUEHANNA TOWNSHIP
EAST PENNSBORO
SUSQUEHANNA RIVER
PENBROOK
WORMLEYSBURG
LEMOYNE
0
0.25
0.5
1
Miles

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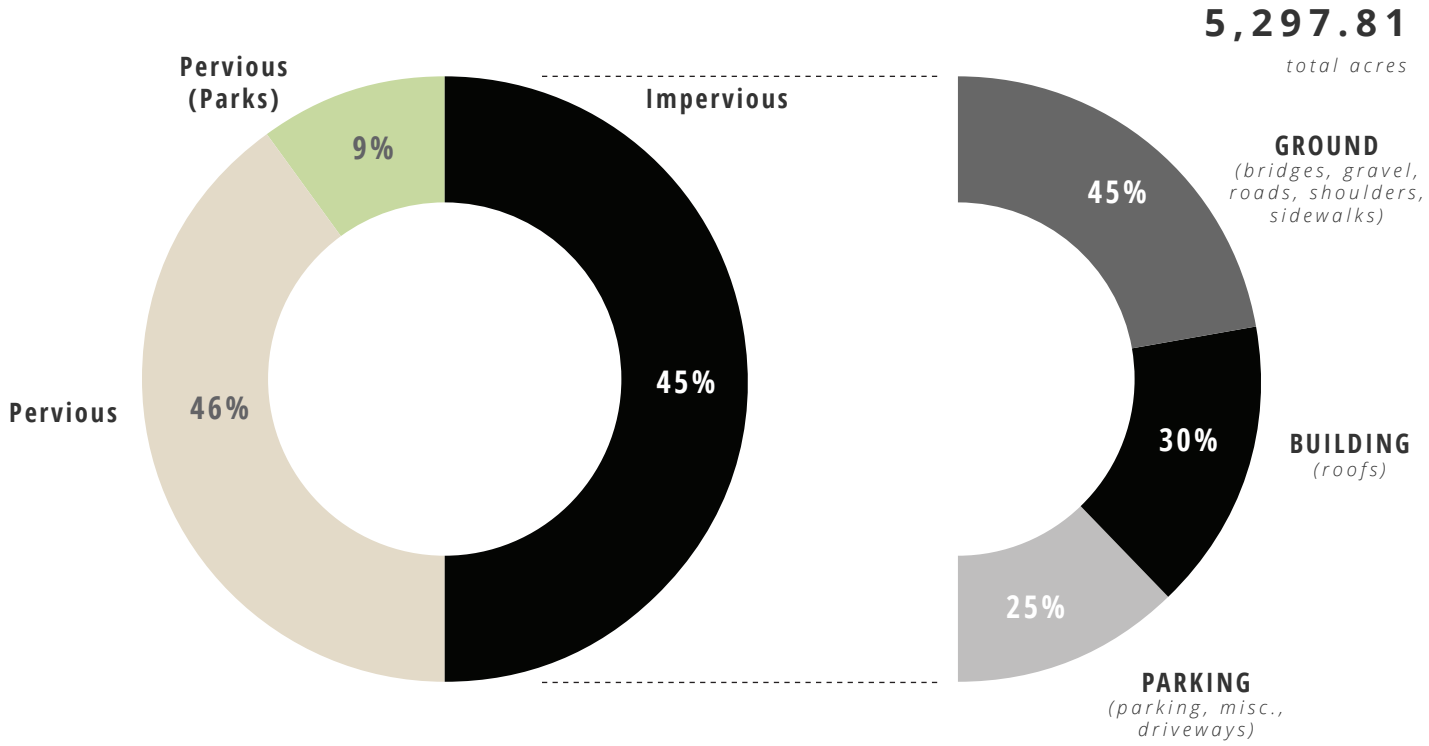
IMPERVIOUS SURFACES

Harrisburg is 45% impervious. This is broken into three categories: ground-level (45%), building (30%), and parking (25%). Ground-level surfaces include bridges, gravel, roads, shoulders, and sidewalks. Impervious building surfaces include roofs of residential, commercial, industrial, and institutional properties. Impervious parking surfaces include parking, driveways, and miscellaneous surfaces. The impervious surfaces map shows the allocation of pervious and impervious surfaces throughout the city. Concentrations of impervious surfaces are particularly notable near key transportation corridors, including rail lines and highways. Additionally, large concentrations of impervious building surfaces are found in downtown, running parallel to the Susquehanna. The high percentage of ground-level surfaces suggests that water running off of streets, sidewalks, and shoulders likely causes a good portion of stormwater runoff and localized street and property flooding in neighborhoods throughout the city.

< 45% OF LAND IN HARRISBURG IS IMPERVIOUS

Parking in commercial areas covers the area of more than 750 football fields (25% of impervious area). Parks and Recreation parcels have the highest percentage of pervious surfaces.

Parking (19%), roads (0%), and commercial (20%) parcels have the lowest percentage of pervious surfaces. Roads represent the largest land use and have the highest percentage of impervious surfaces (100%)



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WHERE IS THE WATER COMING FROM?

IMPERVIOUS SURFACES BY LAND USE

Understanding where concentrations of impervious surfaces are located can help determine where investment in green or grey infrastructure should be targeted. For example, roads, parking, commercial, mixed use, industrial, and transportation and utilities land uses all average over 60 percent impervious. These land uses make up 29 percent of Harrisburg's total land area. Based on this analysis, these land uses would be prioritized in a program to reduce stormwater. However, each of these land uses has a specific set of opportunities and potential issues related to stormwater.

Parking represents only three percent, or 134.9 acres of the city's land area, but is 81 percent impervious. The top three landowners in this category own about 37 percent of all parking land area. However, with the exception of a few large municipal and state parking lots, a majority of parking lots are privately owned.

Commercial land uses represent six percent, or 298.5 acres of the city's land area, but are 80 percent impervious. The top three landowners in this category own about 15 percent of all commercial land on three single parcels. While this land use has potential for contributing to the management of stormwater, all of the parcels are privately owned, which would require partnerships with individual owners.

Mixed use represents only one percent, or 31 acres of the city's land area, but is 79 percent impervious. An overwhelming majority of impervious surfaces, 74 percent, are building roofs. Unlike some other categories, mixed use properties have 336 different owners, making coordination with owners more difficult compared to other uses.

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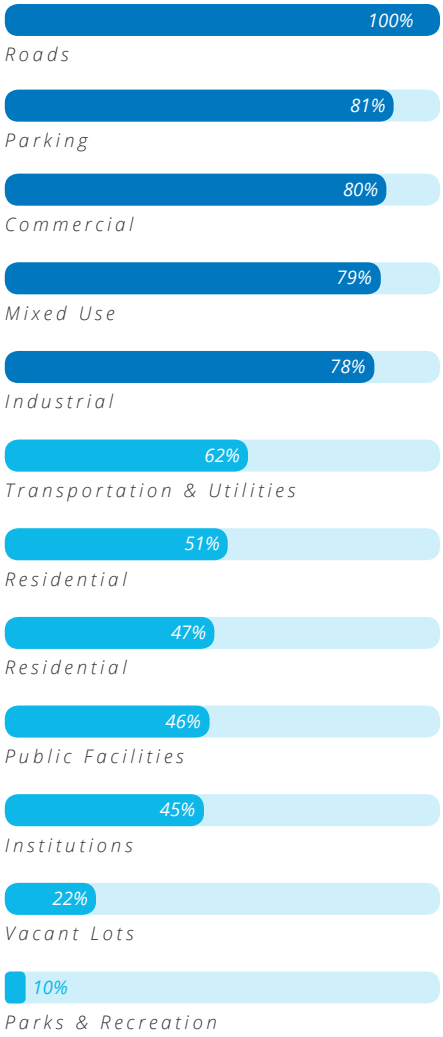
LAND USES WITH THE HIGHEST PERCENTAGE OF IMPERVIOUS SURFACES



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THE SOLUTIONS

Credit: Capital Region Water

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A COMMUNITY APPROACH

Given that the issues surrounding green stormwater infrastructure are all connected, they require big picture thinking and partnerships. The City and community's participation the planning process to create this Community Greening Plan — from residents, to partner organizations, to experts in design and infrastructure — was essential and will continue to be vital to its implementation. For example, during community meetings, participants stressed the importance of improving streets, parks, vacant lots, schools, trees, and the river through community greening solutions. The opportunities to improve these public and open spaces are detailed and prioritized throughout the plan. There are numerous ways in which the projects will benefit the public, including improving water quality, attracting economic investments, reviving public space in distressed neighborhoods, providing new opportunities for recreation, and encouraging redevelopment. Taken together, these greening projects will begin to improve the overall sustainability of Harrisburg — often described through the lens of the triple bottom line – the city's environment, economy, and equity.

Capital Region Water will continue working with the community to find opportunities to beautify and revitalize neighborhoods throughout Harrisburg.

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A COMMUNITY-DRIVEN PLAN

A community-driven plan means more than just making contact or engaging with community residents. It is about making sure individuals and groups in the community are represented, have meaningful opportunities to have their voices heard, and see those opinions reflected in the final plan. In order for this to be successful, a community engagement process must expand opportunities for dialogue, empower residents, and foster ownership of the recommendations included in the plan.

The Community Greening Plan was developed through a process that encouraged the entire community to contribute ideas. These ideas are included and reflected in the program and project recommendations. Over the course of this 18-month process, Capital Region Water engaged with over five hundred residents and held more than thirty engagement events with the community. Public meetings, Community Greening Parties, small workshops, focus group meetings, community events, and online surveys provided many opportunities for residents to engage in a dialogue about stormwater, its effects, and the potential solutions. Social media, fliers, website updates, person-to-person interactions, media placements, and emails provided supplementary outreach.

The community's participation in this planning process was essential. The plan represents Capital Region Water's commitment to implementing a green stormwater infrastructure program in partnership with Harrisburg's communities to address common concerns. Flooding, pollution, sewer backups and other stormwater-related issues affect neighborhoods throughout the city. Capital Region Water plans to work with and engage communities in an effort to ensure that all residents benefit from the Community Greening Plan.

>
RESIDENTS ATTEND THE COMMUNITY GREENING PARTY @ THE CAMP CURTIN YMCA

Capital Region Water held one of its Community Greening Parties at Camp Curtin YMCA's National Night Out. Residents enjoyed a fun night of food and fun while providing input on community greening concepts for Harrisburg.

Credit: Capital Region Water

> COMMUNITY AMBASSADORS TOUR GSI PROJECTS IN LANCASTER, PA

Capital Region Water traveled with the Community Ambassadors to Lancaster in January of 2016 to tour green stormwater infrastructure projects with the city's Stormwater Manager, Ruth Hocker. The tour gave the group an opportunity to see pervious paving, stormwater bumpouts, green parking strategies, and more.

In June of 2016, the Community Ambassadors toured additional green stormwater infrastructure sites, including the 'Big Green Block' with representatives from Philadelphia Water in Philadelphia.

Credit: Capital Region Water

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Meet your Community Ambassadors

Engaging every community in Harrisburg was one of the most important components of the plan. Capital Region Water created the Community Ambassador program to empower interested residents with knowledge about stormwater issues encourage them to reach out to their neighbors to share this information and get feedback through face-to-face interactions. They act as advocates for their neighborhood, provide information about upcoming events, and help educate their community about green stormwater infrastructure and community greening measures. Capital Region Water will continue to work with the ambassadors to build capacity and advocate for their neighborhoods and their city.

- **Bill Allis**
- **Bishop Roberta Thomas**
- **Brian Humphrey**
- **Evelyn Hunt**
- **Cheryl Capozzoli**
- **David Botero**
- **Garvey Presley**
- **Gloria Vasquez Merrick**
- **Jamien Harvey**
- **Loretta Darbee-Dare**
- **Pam Goodwin**
- **Rafiqya Muhammad**
- **Rhonda Mays**
- **Scott Schepler**
- **Tara Leo Auchey**
- **Terry Lawson**
- **Jean Cutler**
- **Gary Huggens**
- **Claude Phipps**

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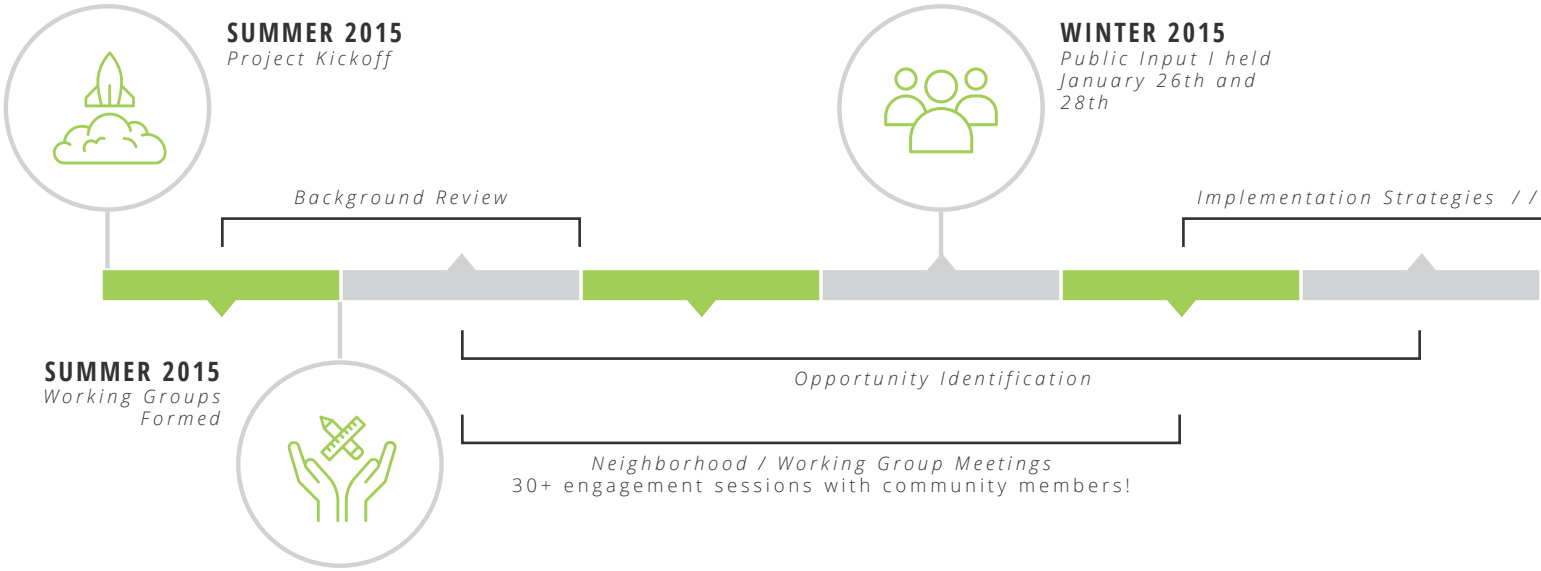
THE PROCESS

The 18-month planning process engaged residents, stakeholders, and field experts to create a Community Greening Plan for Harrisburg. Capital Region Water engaged WRT, a planning and design firm in Philadelphia, as a consultant to complete the plan. Stakeholder engagement was facilitated through the creation of three workgroups. Starting in the Summer of 2015, Capital Region Water, the consultant team, and other partners met with the Community Greening Plan working groups: a Community Ambassador Workgroup and a GSI Partners Workgroup. The working groups provided input on public engagement strategies, prioritization criteria, and implementation and program recommendations.

The Community Ambassador workgroup is made up of representatives from neighborhoods across Harrisburg. More information about this group is found on the previous page.



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Credit: WRT

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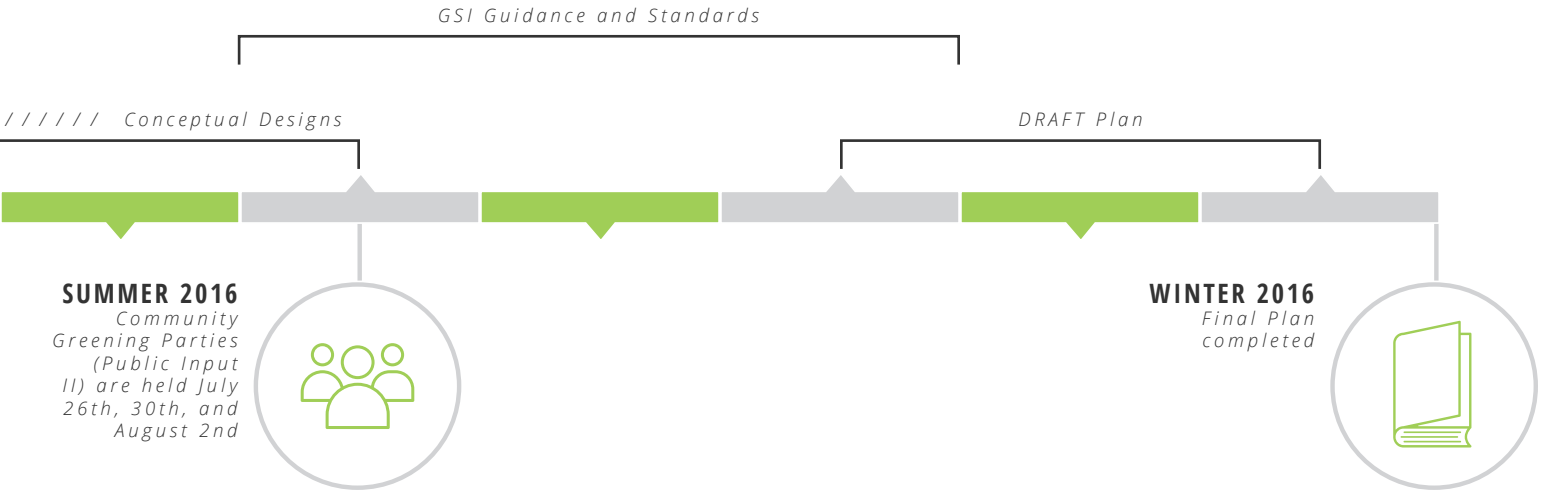
30+ COMMUNITY ENGAGEMENT EVENTS INCLUDING PUBLIC MEETINGS AND COMMUNITY GREENING PARTIES

Residents from South Harrisburg provide input on where green stormwater infrastructure strategies should be prioritized across the city.



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RAIN GARDEN
FLOW-THROUGH PLANTER
GREEN R
STORMWATER BUMPOUT
PERVIOUS PAVING
RAIN BARREL
STOR

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GREEN SOLUTIONS

Green infrastructure presents an exciting opportunity to reduce stormwater runoff and leverage infrastructure investment to transform and revitalize communities. There are many types of green stormwater infrastructure (GSI) tools that can be employed at a variety of scales, from a single house to an entire city block or neighborhood. All GSI provides a mix of environmental, social, and economic benefits, though the specific benefits vary by tool.

This section provides details about a number of green stormwater infrastructure solutions, including green stormwater planters, bioswales, stormwater wetlands, cisterns, stormwater basins, and stormwater tree trenches. Each "fact sheet" provides a description of the GSI tool, general scale guidelines, application, maintenance and cost requirements, limitations, and benefits. The final portion of this section provides a description of the possible triple bottom line benefits of green stormwater infrastructure to the environmental, social, and economic health of communities.

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TYPES OF GSI

HOW DO PLANTS FILTER STORMWATER? *EVAPOTRANSPIRATION*

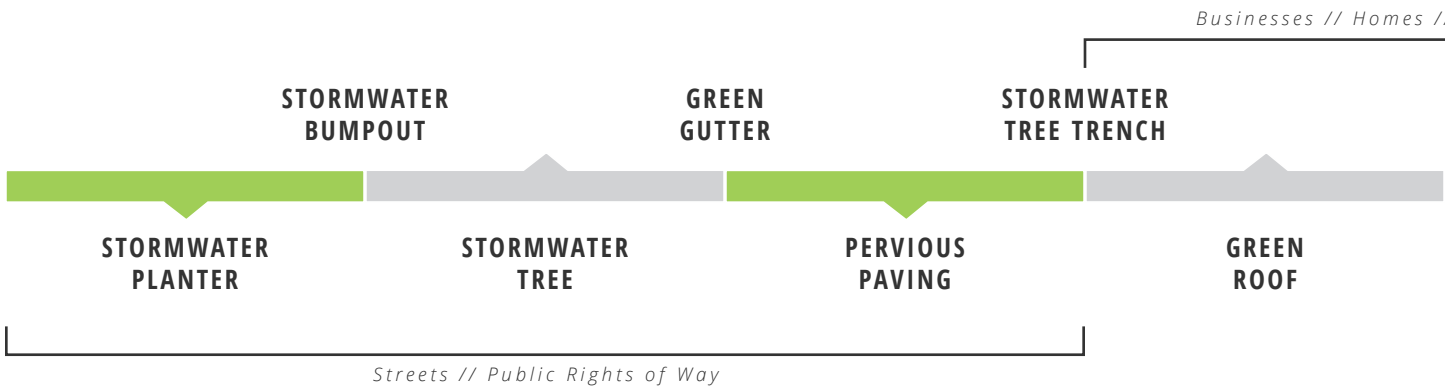
Evapotranspiration is the process by which water absorbed by a plant and soil is released into the air.

Green stormwater infrastructure works across land uses, scales, or contexts. At a small scale, rain barrels or flow-through planters can be attached to downspouts on homes to manage runoff from roofs. At the neighborhood or block scale, Rain gardens or stormwater planters can manage stormwater from a block or a street. At the regional or city-wide scale, stormwater wetlands or restored forests or floodplains can restore critical natural landscapes and reduce runoff.

The graphic below provides a general guide for the scale and application of various types of GSI. For example, stormwater wetlands, stormwater basins, and bioswales are called out as large-scale strategies because they typically require a moderate amount of space to be successful. These are only general guidelines. Individual sizing should be based on site analysis and research.

GREEN STORMWATER INFRASTRUCTURE

GSI comes in a variety of shapes, sizes, and applications. The Green Infrastructure Fact Sheets provide additional information about each type (*see Appendix A*).



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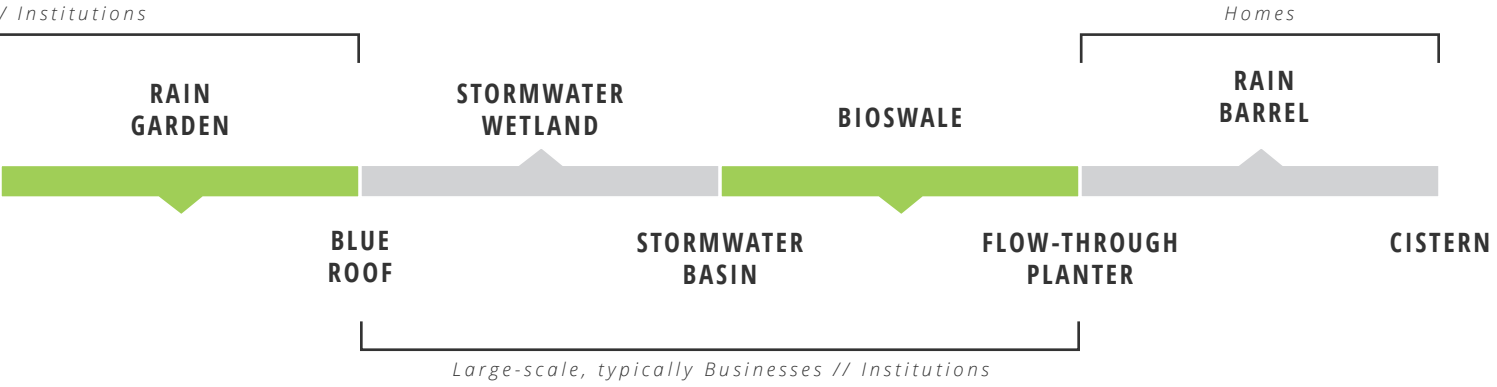
Credit: Flickr // Brad Davis AICP

< STORMWATER PLANTERS & STORMWATER TREES

Stormwater planters and stormwater trees line a sidewalk, filtering and reducing runoff while creating a buffer between pedestrians and vehicular traffic.



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GREEN INFRASTRUCTURE CAN PROVIDE NUMEROUS SOCIAL BENEFITS

Green infrastructure projects can enhance recreation. For example, implementing green school strategies may result in additional green spaces for school children.

WHAT ARE THE BENEFITS?

The primary benefit of green stormwater infrastructure is the management of stormwater. However, GSI has the potential to provide additional social, environmental, and economic benefits that leverage stormwater investments. These triple bottom line benefits are not provided by traditional infrastructure.

SOCIAL

Engage the Community. Green stormwater infrastructure and community greening investment can bring people together and connect them to the environment. Communities can get involved with planning for their neighborhood, build a rain garden, plant a tree, or enjoy a new community garden or playground. According to study

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< THE TRIPLE BOTTOM LINE

Triple bottom line benefits represent additional environmental, social, and economic benefits that may be accrued by implementing green stormwater management.

conducted by the University of Illinois, residents who had trees and green space near their homes reported knowing more people in their immediate community, having stronger feelings of unity, and were more willing to help their fellow neighbors than residents in housing developments without trees and green space.

Improve public health. Greening communities improves air quality and enhances recreational opportunities, which improve public health. Studies have shown that just being in contact with nature causes a four percent decrease in stress levels and a two percent increase in satisfaction. Research studies, including a study by Penn State University's Department of Emergency Medicine, found that blood pressure, heart rate, and stress levels decrease after spending time in a greened space. Benefits may include reduced asthma rates, less stress and anxiety, lower rates of childhood and adult obesity, and even reduced mortality rates.

Reduce heat. Planting additional trees, installing green or blue roofs, and increasing the amount of impervious surfaces in urban areas can reduce the heat island effect caused by a concentration of paved areas. Reducing the heat island effect not only provides for a more comfortable urban environment, but may also reduce the number of heat-related deaths in the summer.

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Credit: Capital Region Water

ENVIRONMENTAL

Improve water quality. Green stormwater infrastructure reduces the amount of stormwater and filters it before entering the sewer system or waterways. This lowers the potential for damaging flooding and combined sewer overflows which can pollute waterways.

Restore ecosystems. Restoring streams, controlling erosion, and improving the health of waterways restores ecosystems and encourages biodiversity. Green stormwater infrastructure can also create new wildlife habitats.

Improve air quality. Planting additional trees and greening communities improve air quality by filtering out pollutants.

Save energy. Planting trees and installing green roofs can reduce energy bills by shading structures and providing additional insulation.

ECONOMIC

Spur private investment. Greening communities by building parks, investing in infrastructure, and planting trees can spur private investment from developers and improve property values.

Create jobs. Workers are needed to plan, design, build, and maintain green stormwater infrastructure.

Revitalize neighborhoods. Community greening can have a transformative effect on neighborhoods by increasing the number of amenities, including parks and streetscapes, building resident capacity, and reutilizing vacant lots. These investments can neighborhood improve property values.

Credit: Flickr // DC Greens

03

THE OPPORTUNITIES

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WHAT ARE THE OPPORTUNITIES?

What are the opportunities for green stormwater infrastructure in Harrisburg? The previously discussed analyses of land use, impervious surfaces, and problem areas, play a part. In addition, land ownership/control, the location of existing trees, parks, utilities, and other spatial and non-spatial characteristics play a part. These criteria are separated into two sets of factors — stormwater potential and ranking.

Together, these factors, when applied to the city, identify opportunities for a network of green stormwater infrastructure projects. The opportunities represent a starting point for Capital Region Water to identify locations for pilot green stormwater infrastructure projects and to determine where the most easily implementable may be. During implementation, Capital Region Water will use the prioritization map as a basis and layer other criteria, including community and partner support, to determine the best locations for green stormwater infrastructure.

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STORMWATER POTENTIAL AND RANKING

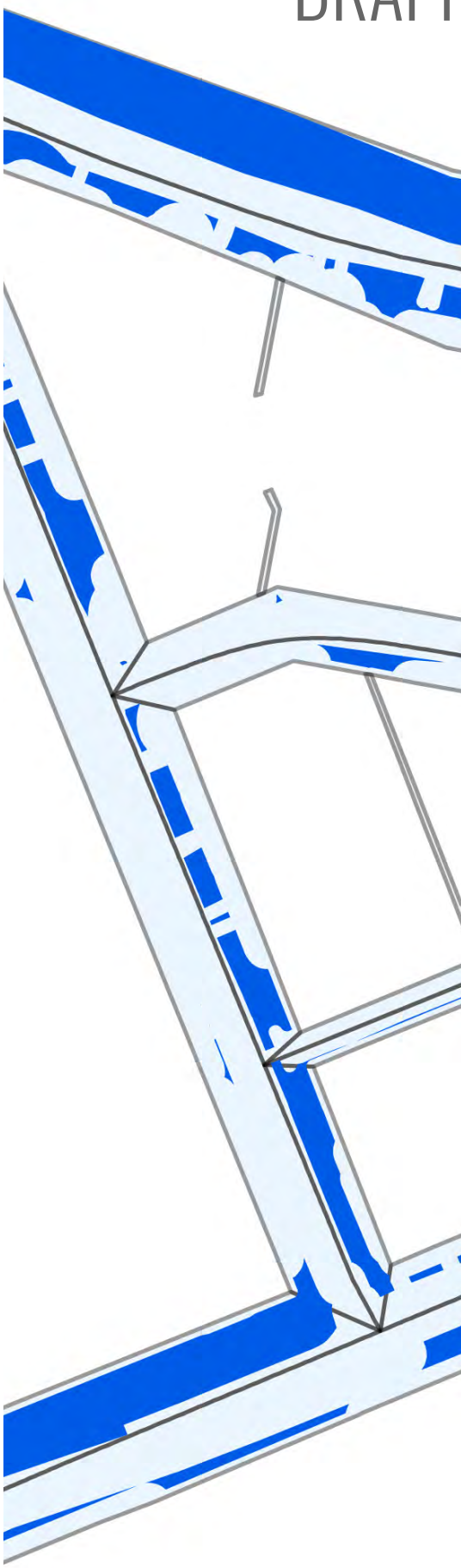
Stormwater potential and ranking was determined for the entire city of Harrisburg. For streets, drainage areas extend from the parcel line to the center line of streets and were delineated based on elevation, street flow, and the location of existing sewer inlets. Blocks are often divided into multiple drainage areas because streets are "crowned" (higher) in the center. They may also be divided into multiple drainage areas if there is a high point in the middle of a block. Parcels were considered independently based on property lines.

STORMWATER POTENTIAL

Stormwater potential is simply the physical potential of a site or street drainage area to manage stormwater. In other words, stormwater potential indicates where there is space to install green stormwater infrastructure.

RANKING OPPORTUNITIES

While stormwater potential highlights areas with physical opportunity, it does not reveal the full scope of possibilities. A second layer of criteria, or ranking, was added to stormwater potential to take into account the potential for partnerships. This can include partnerships with community groups or local agencies, and coordination with existing projects. Different sets of ranking criteria are used for streets and parcels to address site-specific and contextual differences.



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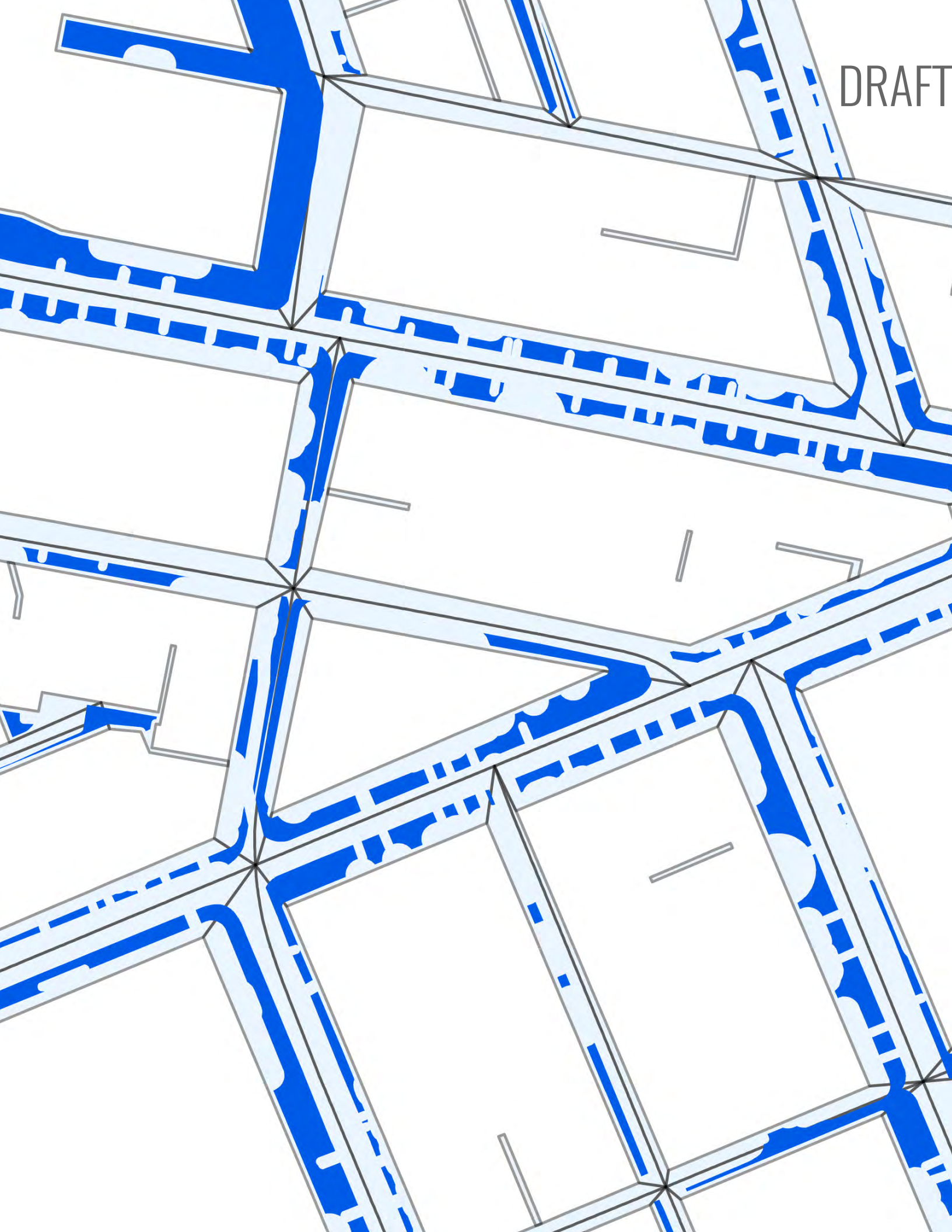
STORMWATER POTENTIAL IS THE PHYSICAL POTENTIAL OF A PARCEL OR STREET DRAINAGE AREA TO MANAGE STORMWATER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STORMWATER POTENTIAL

the physical potential of a parcel / drainage area to manage stormwater

+

STORMWATER RANKING

the ranking of a parcel / drainage area based on partnership potential

Streets

1. **ENSURE COST EFFECTIVENESS**
2. **AVOID SPATIAL CONFLICTS**
3. **MANAGE OVERFLOW**
4. **PROVIDE AREA FOR INFILTRATION**
5. **AVOID PROBLEM AREAS**

Streets

6. **POTENTIAL / PLANNED PROJECTS**
7. **PROX. TO HIGHLY RANKED DRAINAGE AREAS**

> STORMWATER POTENTIAL FOR STREETS

This diagram walks through the stormwater potential and ranking steps for streets. Five factors contributed to the stormwater potential for streets.

1. ***Ensure cost effectiveness*** *by ensuring that street drainage areas meet minimum size requirements (5,000 square feet).*
2. ***Avoid spatial conflicts*** *by minimizing infiltration adjacent to buildings, preventing utility conflicts, maintaining separation from public property, reducing conflicts with existing healthy street trees, and avoiding existing curb-cuts and driveways.*
3. ***Manage overflow*** *by ensuring that drainage areas are within a certain distance of an existing inlet.*
4. ***Provide area for infiltration*** *by ensuring there is enough space to manage stormwater by maintaining a 10:1 loading ratio.*
5. ***Avoid problem areas,*** *or areas that may not be suitable for infiltration due to instability. This final factor is not applicable in most areas. However, in the South Harrisburg area subsurface problem areas add a layer of challenges to building green stormwater infrastructure. This does not mean that GSI cannot be built in this area, it just adds an additional layer of complexity and limits infiltration opportunities.*

Based on initial stormwater potential rankings, about 40 percent of the city's 6,523 street drainage areas are ranked as high – a 4 or 5 ranking.

^ STORMWATER RANKING FOR STREETS

Two ranking factors contributed to the final score or ranking for streets. These two factors, when added to the five stormwater potential factors, result in a possible ranking from 0-7, with 7 being the highest ranking.

6. ***Potential or planned projects.*** *This includes proximity to transportation projects and redevelopment areas.*
7. ***Proximity to highly ranked drainage areas*** *or priority parcels where opportunities for grouping green stormwater infrastructure projects may be possible.*

After applying ranking criteria, about 4 percent, or 270 drainage areas are ranked as a very high, a 6 or 7 ranking.

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STORMWATER POTENTIAL

the physical potential of a parcel / drainage area to manage stormwater

+

STORMWATER RANKING

the ranking of a parcel / drainage area based on partnership potential

Parcels

1. **ENSURE COST EFFECTIVENESS**
2. **AVOID PROBLEM AREAS**
3. **POTENTIAL / PLANNED PROJECTS**
4. **PROX. TO HIGHLY RANKED DRAINAGE AREAS**
5. **PUBLICLY OWNED PARCELS**
6. **STRATEGIC LAND OWNERS**
7. **PRODUCTIVE LAND USE (VACANT LOTS)**

Parcels

^ STORMWATER POTENTIAL FOR PARCELS

Two factors contributed to the stormwater potential rankings for parcels.

1. ***Ensure cost-effectiveness*** *by ensuring that parcel areas meet minimum size requirements. Given that not all of the parcel will likely be used for GSI, certain percentages of sidewalk and parking impervious area and all of the pervious area contributed to the 500 square foot minimum size requirement.*
2. ***Avoid problem areas****, or areas that may not be suitable for infiltration due to instability. This final factor is not applicable in most areas.*

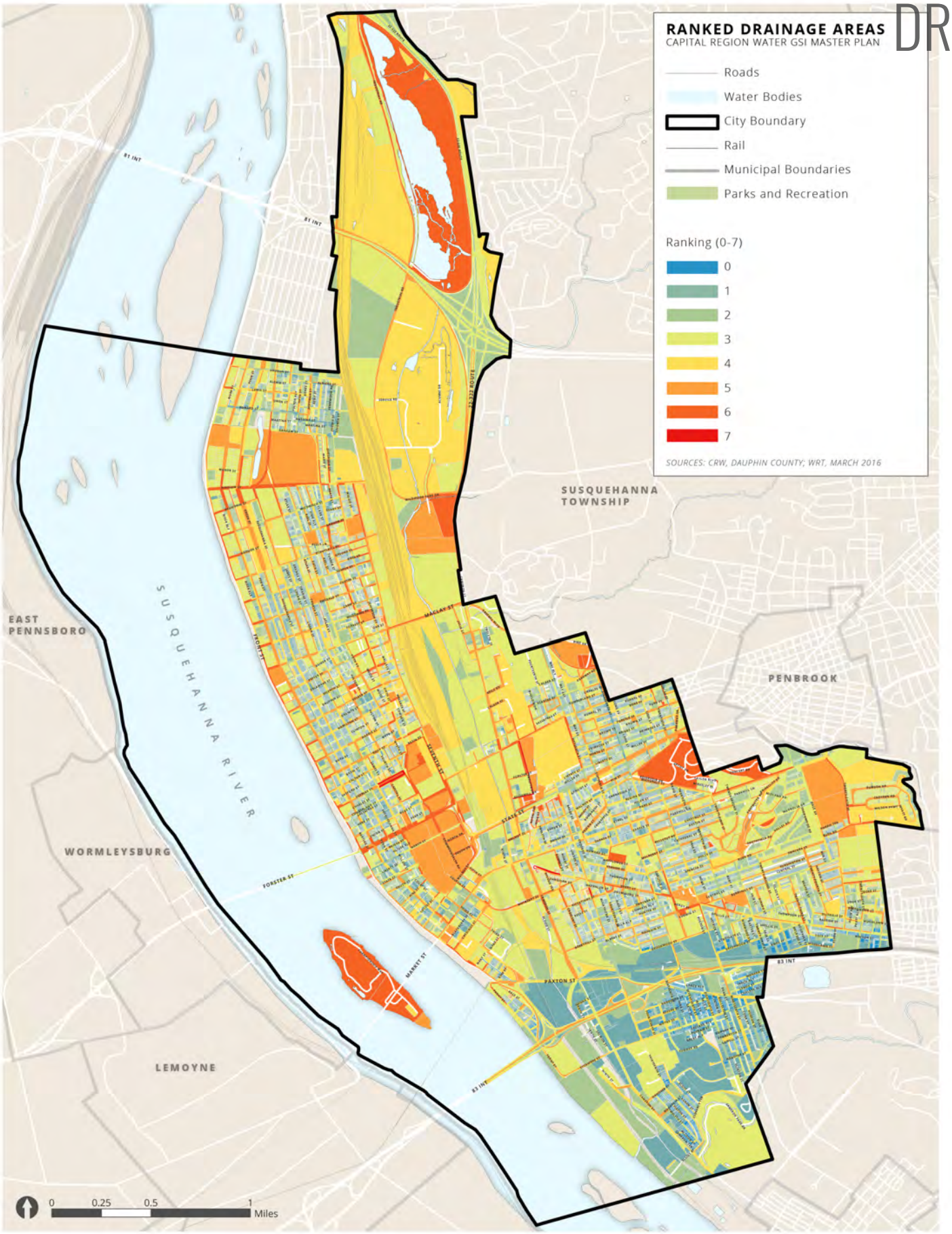
Based on initial stormwater potential rankings, about 23 percent of the city's 20,148 parcel drainage areas are ranked as a high potential, a 2 ranking.

< STORMWATER RANKING FOR PARCELS

Five ranking factors contributed to the final score or ranking for parcels. These five factors, when added to the two stormwater potential factors, result in a possible ranking from 0-7, with 7 being the highest ranking.

3. ***Potential or planned projects.*** *This includes proximity to transportation projects and redevelopment areas.*
4. ***Proximity to highly ranked drainage areas*** *or priority parcels where opportunities for grouping green stormwater infrastructure projects may be possible.*
5. ***Public ownership.*** *A publicly owned parcel has a greater potential for green stormwater infrastructure compared to privately owned parcels.*
6. ***Strategic land ownership****, or the landowners with the most property by land use.*
7. ***Productive land use,*** *prioritizes reuse of vacant lots as a potential partnership opportunity.*

After applying ranking criteria, about 3 percent, or 600 drainage areas are ranked as a very high to somewhat high, a 4, 5, 6 or 7 ranking.


RANKED DRAINAGE AREAS
CAPITAL REGION WATER GSI MASTER PLAN
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Roads
Water Bodies
City Boundary
Rail
Municipal Boundaries
Parks and Recreation
Ranking (0-7)
0
1
2
3
4
5
6
7
SOURCES: CRW, DAUPHIN COUNTY; WRT, MARCH 2016
SUSQUEHANNA TOWNSHIP
EAST PENNSBORO
SUSQUEHANNA RIVER
PENBROOK
WORMLEYSBURG
LEMOYNE
MACLAY ST
FORSTER ST
MARKET ST
PAXTON ST
STATE ST
83 INT
0
0.25
0.5
1
Miles

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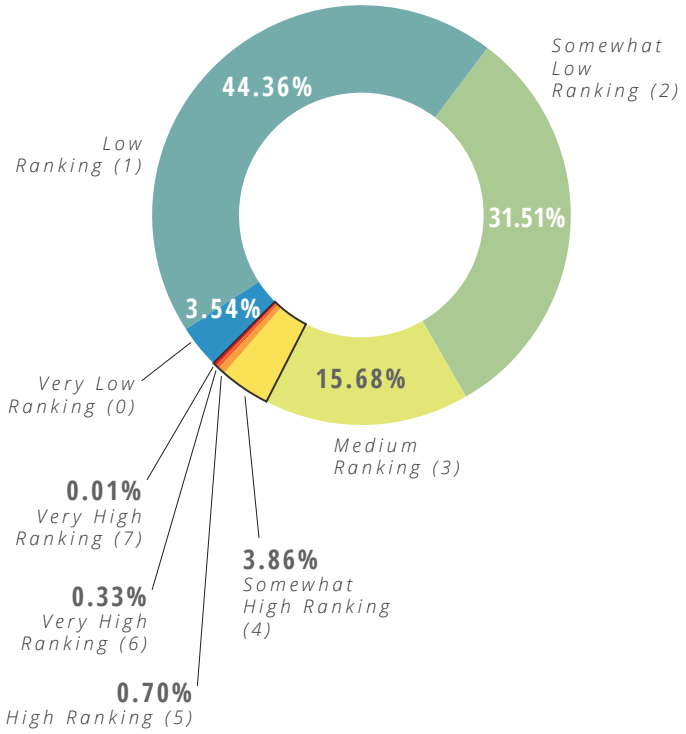
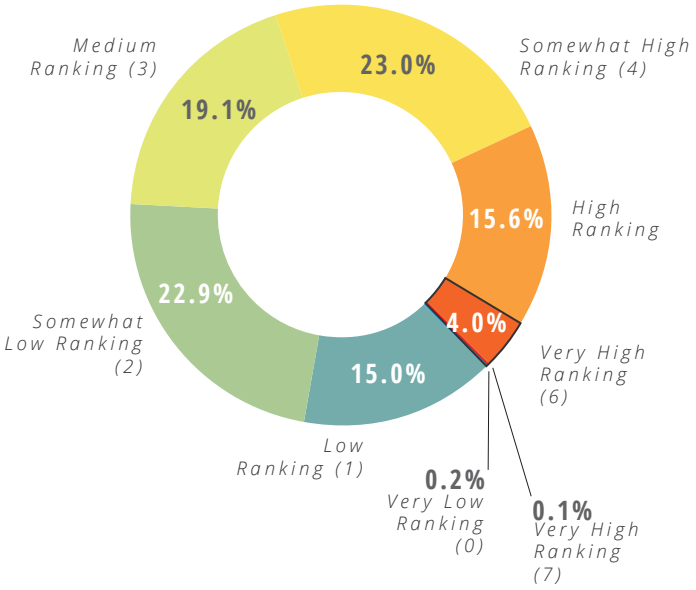
RANKING OF PARCELS & STREETS

The pie charts below depict the breakdown of parcel and street areas by ranking level on a scale from 0-7, with 0 representing very low ranked areas and 7 representing very high ranked areas.

PARCEL RANKING



STREET RANKING



WHAT ARE THE OPPORTUNITIES?

Out of 26,000+ parcel and street drainage areas, only about 7% are considered very high or high ranked sites for GSI.

20,150
parcel drainage areas

1,591 ac
of area potentially managed by somewhat to very high ranked sites (4-7)

6,523
street drainage areas

680 ac
of area potentially managed by very high ranked streets (6-7)

Credit: Flickr // Center for Neighborhood Technology

DRAFT

COMMUNITY GREENING CONCEPTS

What might green stormwater infrastructure look like in Harrisburg? Using input from public meetings, where residents indicated where they wanted to see community greening investment in streets, parks, vacant lots, and schools, ten community greening concept categories were created. The ten categories — green alleys, green neighborhoods, green public spaces, green parks, green vacant lots, green community centers, green streets, green businesses, green schools, and green homes — represent many of the opportunities for community greening in Harrisburg.

The following sections illustrate these green stormwater strategies and how they may transform the neighborhoods, streets, and public spaces in Harrisburg.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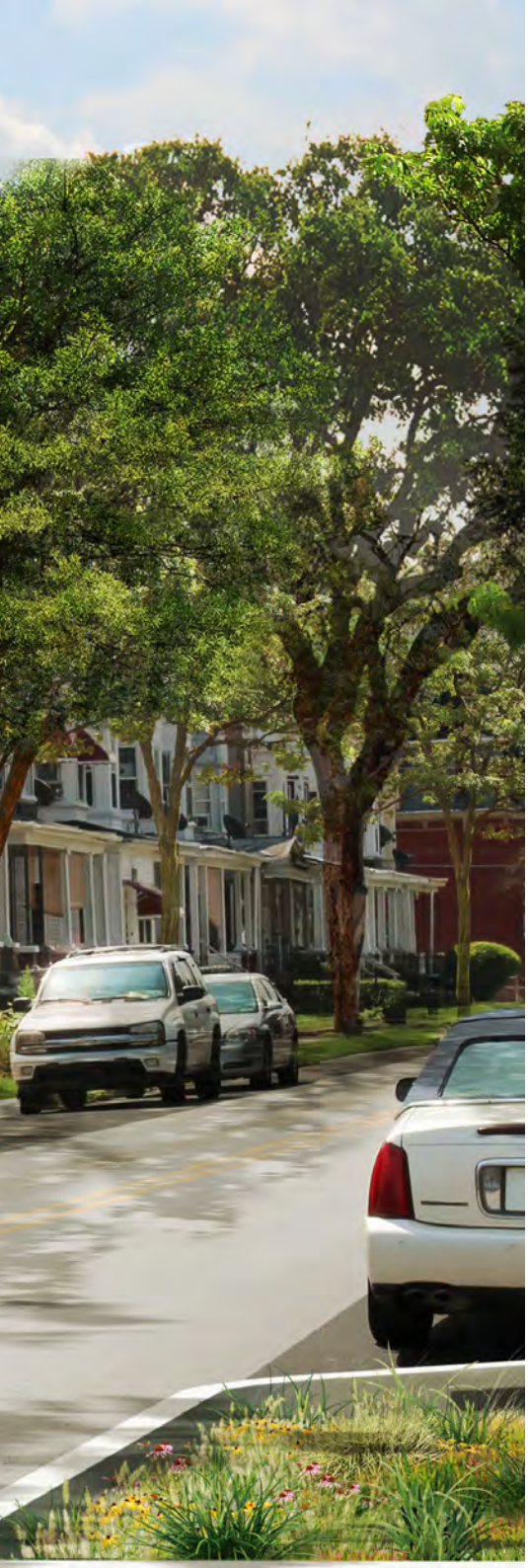

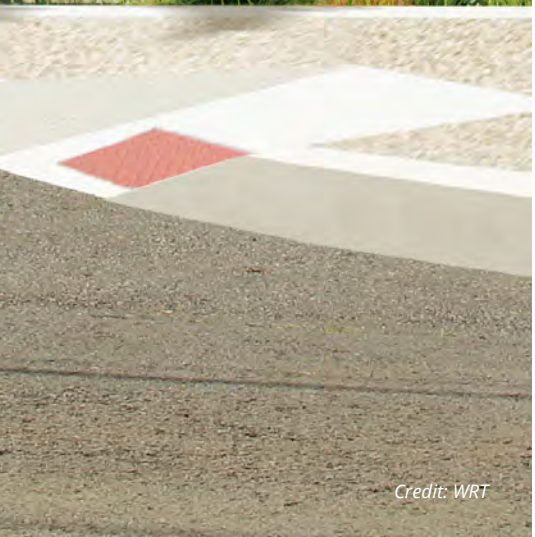

Credit: WRT

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Green Neighborhoods

Neighborhoods, including streets, homes, and small businesses are the building blocks of cities. Community greening and green stormwater infrastructure have the potential to revitalize neighborhoods and improve public health. Simple actions like planting street trees, installing flow-through planters, or planting rain gardens can dramatically transform the look of a neighborhood or block.

STORMWATER BUMPOUTS CALM TRAFFIC AND IMPROVE PEDESTRIAN SAFETY.

Stormwater bumpouts reduce the distance needed to cross the street and calm traffic improving pedestrian safety.

THE CONCEPT

The community greening concept neighborhoods, illustrated on the 2200 block of 4th Street, between Emerald Street and Woodbine Street, utilizes a series of green stormwater infrastructure strategies in the street right-of-way and on private properties. This block, located in Midtown, lacks consistent streetscaping and has few street trees. Strategies for the street right-of-way include stormwater tree trenches, stormwater bumpouts, and depaving. Strategies for private properties include rain gardens, flow-through planters, and rain barrels.

In this illustration, stormwater tree trenches line both sides of 4th Street. These trenches not only manage stormwater runoff from the street with an underground system of stone storage, but also increase tree canopy, which provides shade, reduces the heat island effect, and improves air quality. Stormwater bumpouts located midblock and at the both corners manage stormwater from the street right-of-way, beautify the street, and improve pedestrian safety by reducing the distance required to cross the street. Finally, depaving of a portion of the western sidewalk reduces the amount of impervious surface, improves curb appeal, and creates a more welcoming pedestrian environment. A small rain garden, flow-through planter, and rain barrel manage stormwater runoff from roofs on the eastern side of the street.

^
BEFORE IMAGE

<
STREET TREES PROVIDE SHADE AND IMPROVE AIR QUALITY

Street trees, stormwater tree trenches, stormwater bumpouts, and depaving reduce impervious surfaces, filter and manage stormwater runoff, and beautify the block.

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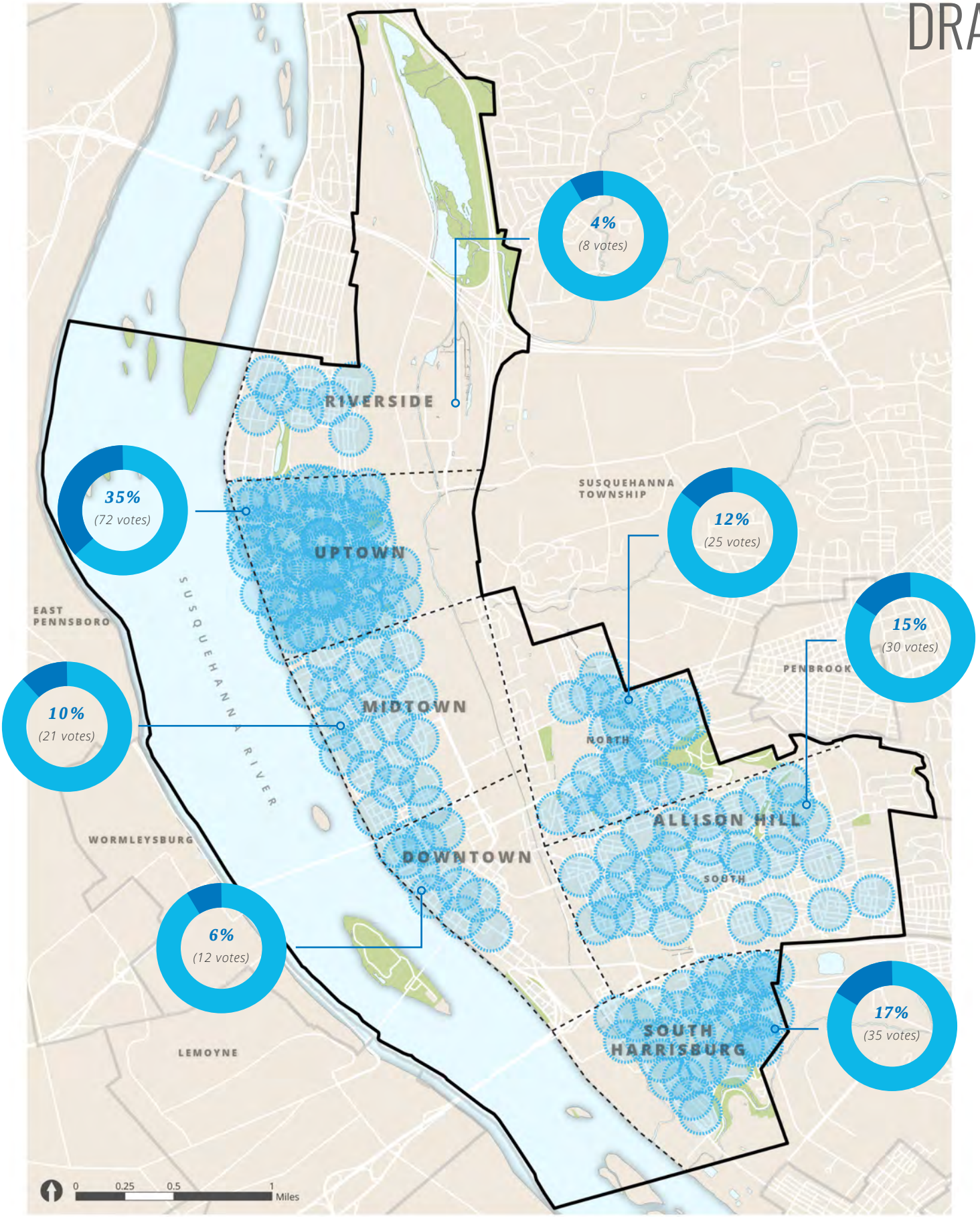
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GREEN NEIGHBORHOOD OPPORTUNITIES

Residents attending the Community Greening Parties identified other neighborhoods in the city that are opportunities for green neighborhoods. While 50 percent of participants identified the Uptown and South Allison Hill neighborhoods, all of the neighborhoods were identified as opportunities to be green neighborhoods.

POTENTIAL PARTNERSHIPS

Potential partners for green neighborhoods include:

- homeowners
- community organizations
- neighborhood associations
- business owners
- City of Harrisburg
- Department of Public Works
- CAT

<

UPTOWN AND SOUTH ALLISON HILL WERE THE TOP 2 REQUESTED LOCATIONS FOR GREEN NEIGHBORHOODS

50 percent of participants at the second round of public meetings wanted green strategies to be employed in the Uptown and South Allison Hill neighborhoods.


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Credit: WRT

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Green Parks

Parks provide great opportunities for green stormwater infrastructure. They are publicly owned, often have the space needed for GSI, and are highly visible sites. Parks range in scale from small neighborhood parks and playgrounds, like 4th and Dauphin, to large city-wide parks, like Reservoir Park. GSI can be replicated and tailored to fit a variety of environments and scales.

PERVIOUS BASKETBALL COURT

A new pervious basketball court not only provides a new surface for playing, but also manages stormwater that falls on the court and has additional underground storage to manage overflow from the rain garden, street planters, and swale.

THE CONCEPT

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The green parks concept is illustrated here at 4th and Dauphin Park, a small, neighborhood park located in Midtown across from the Pennsylvania National Fire Museum. The green parks concept focuses on managing stormwater runoff from impervious surfaces within the park and on the adjacent street drainage areas. This park, along with four other parks in the city, received funding for improvements from the state Department of Community and Economic Development and the state Department of Conservation and Natural Resources (DCNR). The proposed GSI strategies include a bioswale that connects two rain gardens at either end of the park, pervious paving, and a porous basketball court with subsurface storage.

In this illustration, a rain garden behind the play equipment captures runoff from the street right-of-way and the small parking lot. Overflow from the rain garden would then travel down a bioswale that follows the curve of a pedestrian path. The rain garden,in the foreground, collects stormwater from the street right-of-way as well as overflow from the connected bioswale. Pervious paving along the sidewalk replaces existing asphalt, reducing the amount of impervious surface. New street trees planted in the sidewalk/plaza are provide shade for the basketball court and seating area. The porous

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basketball court manages surface runoff and the subsurface storage contains storage space for overflow from the rain gardens and swale.

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BEFORE IMAGE

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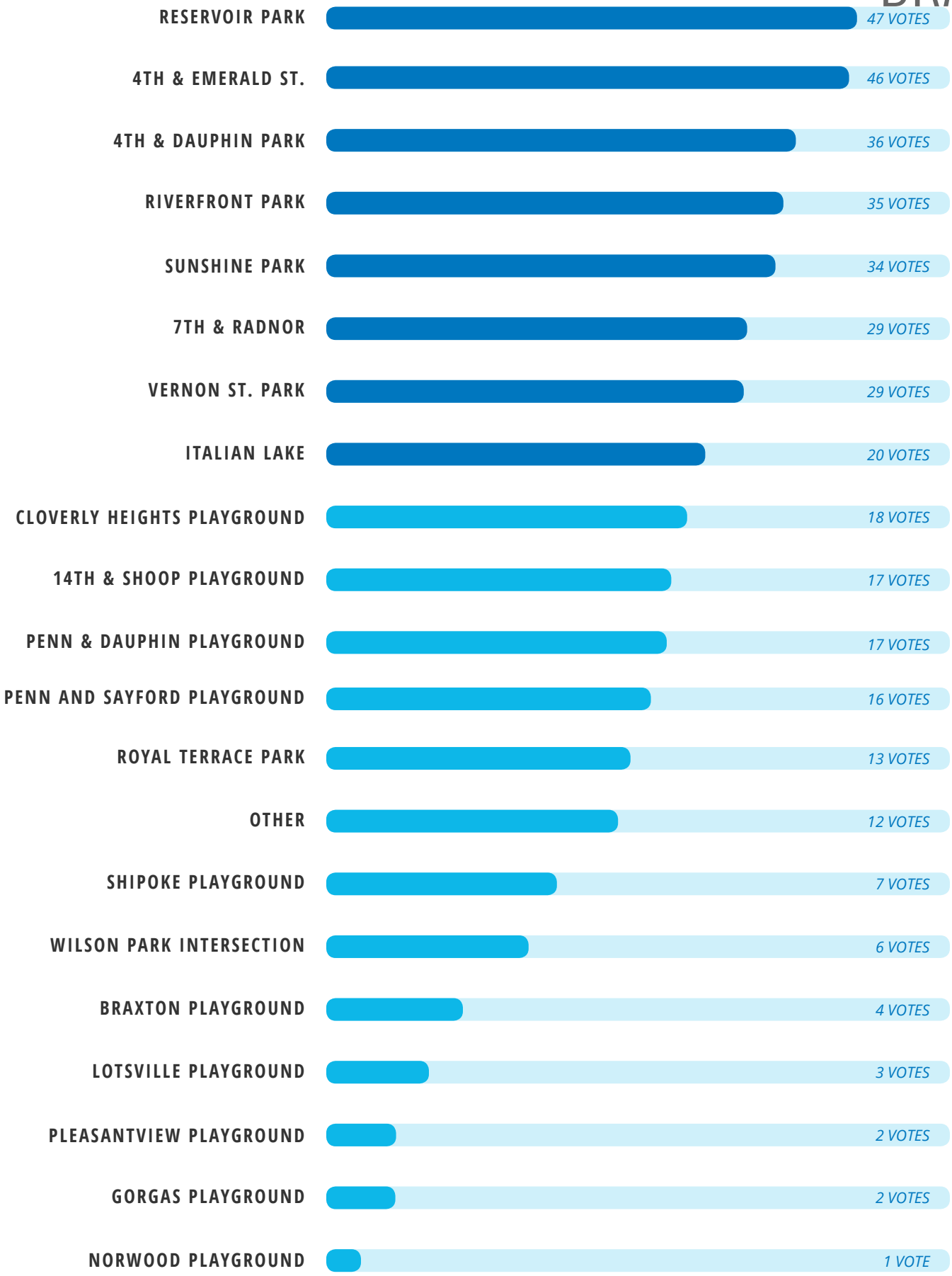
RESERVOIR PARK
47 VOTES
4TH & EMERALD ST.
46 VOTES
4TH & DAUPHIN PARK
36 VOTES
RIVERFRONT PARK
35 VOTES
SUNSHINE PARK
34 VOTES
7TH & RADNOR
29 VOTES
VERNON ST. PARK
29 VOTES
ITALIAN LAKE
20 VOTES
CLOVERLY HEIGHTS PLAYGROUND
18 VOTES
14TH & SHOOP PLAYGROUND
17 VOTES
PENN & DAUPHIN PLAYGROUND
17 VOTES
PENN AND SAYFORD PLAYGROUND
16 VOTES
ROYAL TERRACE PARK
13 VOTES
OTHER
12 VOTES
SHIPOKE PLAYGROUND
7 VOTES
WILSON PARK INTERSECTION
6 VOTES
BRAXTON PLAYGROUND
4 VOTES
LOTSVILLE PLAYGROUND
3 VOTES
PLEASANTVIEW PLAYGROUND
2 VOTES
GORGAS PLAYGROUND
2 VOTES
NORWOOD PLAYGROUND
1 VOTE

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GREEN PARK OPPORTUNITIES

Residents attending the Community Greening Parties identified other parks in the city that might benefit from community greening strategies. Reservoir Park, 4th and Emerald Street Park, 4th and Dauphin Park, and Riverfront Park received the most votes. Reservoir Park and Riverfront Park are large scale parks from the original City Beautiful Plan from 1902 while 4th and Emerald Street Park and 4th and Dauphin Park are smaller, neighborhood-scale parks. Green stormwater strategies, including rain gardens, swales, pervious paving, and tree trenches shown in the concept for 4th and Dauphin could be applied to the both larger scale city parks and smaller scale neighborhood parks.

<

RESERVOIR PARK, 4TH & EMERALD STREET PARK, AND 4TH AND DAUPHIN PARK WERE THE TOP 3 REQUESTED LOCATIONS FOR GREEN PARKS

33 percent of participants at the second round of public meetings wanted green strategies to be employed in Reservoir Park, 4th and Emerald Street Park, and 4th and Dauphin Park.

POTENTIAL PARTNERSHIPS

Potential partners for green parks spaces include:

- community organizations
- neighborhood associations
- City of Harrisburg
- Harrisburg Redevelopment Authority
- Harrisburg Young Professionals
- CAT
- U.S. Green Building Council
- PA Department of Conservation and Natural Resources
- PA Department of Community and Economic Development
- City Beautiful 2.0


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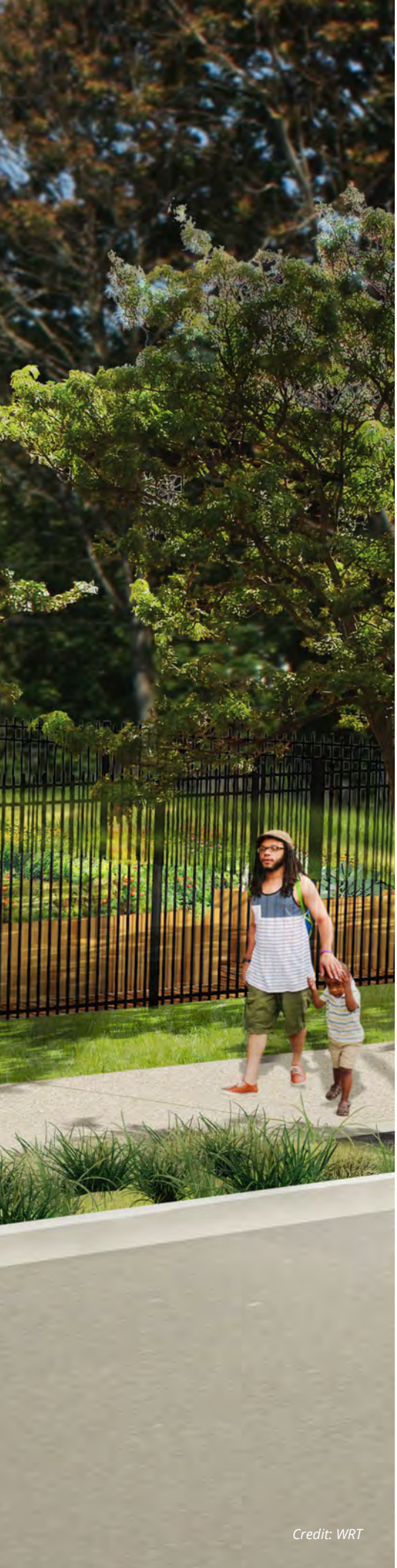

Credit: WRT

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Green Vacant Lots

Vacant lots, especially publicly owned vacant lots, can be put to productive use through redevelopment or community greening. Seven percent of all land in Harrisburg is vacant. Not all of these lots are suitable for redevelopment. Depending on the context, these lots can be used for stormwater management or as open space, community gardens, community gathering spaces, or playgrounds with elements of green stormwater management.

^

COMMUNITY GARDENS + GSI

Community gardens and GSI are a perfect match for reutilizing vacant lots. They are both community-centered uses that engage and require buy-in from surrounding residents.

THE CONCEPT

The community greening concept for green vacant lots, illustrated at the corner of 15th Street and Hunter Street, employs a combination of green stormwater strategies and vacant lot reuse strategies to revitalize a blighting influence in the community. The illustration shows a large community garden and plaza with a rain garden and tree trench to manage stormwater from the adjacent street and sidewalk. This concept transforms an empty space into a productive and safe community-centered use.

The community garden provides a gathering space for residents, while the plaza anchors the corner frontage along 15th Street and Hunter Street. The rain garden, located behind the community garden, reduces and filters runoff from adjacent streets while beautifying the lot. A tree trench with stormwater planters, running parallel to the street, manages street runoff. The trees and natural vegetation provide shade, reduce the heat island effect, enhance the environment, and improve pedestrian safety by providing a buffer between pedestrians and vehicular traffic.

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EDUCATIONAL SIGNAGE

Educational signage explains how rain gardens function. They are great educational tools and help improve the visibility of green stormwater infrastructure projects.

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BEFORE IMAGE

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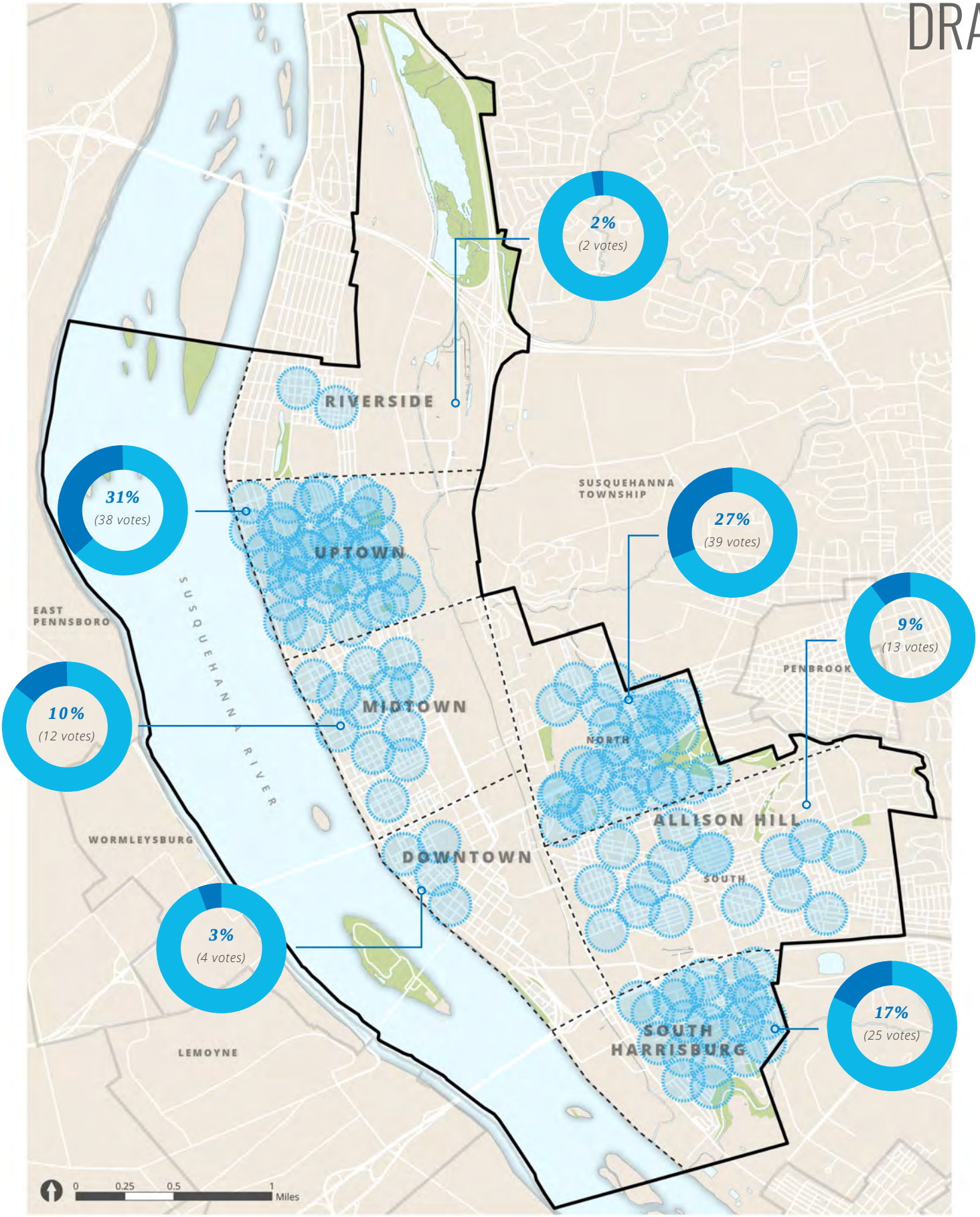
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PENBROOK
EAST PENNSBORO
SUSQUEHANNA RIVER
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MIDTOWN
NORTH
ALLISON HILL
WORMLEYSBURG
DOWNTOWN
SOUTH
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(25 votes)
SOUTH HARRISBURG
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Miles

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GREEN VACANT LOT OPPORTUNITIES

Residents attending the Community Greening Parties identified other areas in the city with vacant lots that might benefit from community greening strategies. Uptown received 31 percent of the votes, with North Allison Hill receiving 27 percent of the votes. Some key vacant lots that were recommended as potential projects included those adjacent to the Broad Street Market and a series of vacant lots on 13th Street near the intersections of Hanover Street, Magnolia Street, and Vernon Street.

POTENTIAL PARTNERSHIPS

Potential partners for green vacant lots include:

- community organizations
- neighborhood associations
- City of Harrisburg
- Harrisburg Redevelopment Authority
- Harrisburg Young Professionals
- PA Department of Conservation and Natural Resources
- Department of Public Works

<

UPTOWN AND NORTH ALLISON HILL WERE THE TOP 2 REQUESTED LOCATIONS FOR GREEN VACANT LOTS

Over 50 percent of participants at the second round of public meetings wanted green strategies to be employed on vacant lots in the Uptown and North Allison Hill neighborhoods.

"By taking abandoned lots and transforming them, it can bring a sense of pride back to the neighborhood" – **Westburn Majors**

04

WHAT'S NEXT

Credit: WRT

DRAFT

THE SITES

Credit: WRT

Working with community groups in Harrisburg, Capital Region Water selected three pilot project areas for green stormwater infrastructure. Within these study areas, Capital Region Water and its consultant team identified opportunities to implement GSI and maximize stormwater management in cost effective and innovative ways. The opportunities demonstrate a wide range of GSI tools from simple, low-cost grading alternatives to signature design projects. Practices that provide management solutions in surface, vegetated systems were prioritized, but the majority of the systems also include a subsurface infiltration or detention component to maximize stormwater management.

The conceptual layout and sizing of the systems was based on providing storage for 1.4" of runoff from impervious areas, limiting the loading ratio of the system to 10:1 to improve the infiltration performance, and connecting to existing sewer-connected inlets or the combined sewer when possible.

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4TH & DAUPHIN PARK

4th and Dauphin Park is located in Midtown across from the Pennsylvania National Fire Museum. The site includes the block surrounding the park, bounded by 4th Street, Kelker Street, Fulton Street, and Muench Street. The park is slated for improvements as part of an effort by the City, funded by grants from the state Department of Community and Economic Development and DCNR, to renovate five parks. GSI strategies were integrated into the existing site plan, with some modifications, served as the basis for the conceptual GSI design.

Proposed GSI strategies include a bioswale downslope of the proposed playground, a porous basketball court with subsurface storage, and a rain garden adjacent to the basketball court where indicated on the park renovation plan. Systems located within the right-of-way include stormwater planters on the east side of 4th Street at Dauphin Street and a bioswale on the north side of Kelker Street at the intersection with 4th Street. The proposed project would manage 35,658 square feet of impervious area.

FOURTH STREET PLANTERS:

Two stormwater planters are proposed along 4th Street to intercept stormwater runoff from the right-of-way and a portion of the park before it reaches the existing inlet at the intersection with Dauphin Street. Stormwater will be diverted from 4th Street into the planters using trench drains to maximize capture. The planting media in the planters will filter runoff and provide temporary storage while the plantings will provide volume removal through evapotranspiration. An overflow in the downslope planter will carry any excess runoff to the stone storage bed underneath the porous basketball court for infiltration and slow release. Plugged underdrains connected to the basketball court's subsurface bed will allow the planters to be drained if the soils prove to be unsuitable for infiltration.

TYPES OF GSI

BIOSWALE

RAIN GARDEN

STORMWATER PLANTER

^

GSI PROJECTS ARE LOCATED ON THE PARK AND KELKER STREET.

The majority of GSI projects are located on the park property with the exception of a stormwater planter on Kelker Street.

LEGEND

A — Groups of Drainage Areas (impervious areas) managed by a GSI system

B — Green Stormwater Infrastructure (GSI) system (i.e., tree trenches, planters, etc.)

^
4TH AND DAUPHIN PARK FROM 4TH STREET

The park is slated for improvements including a new basketball court, and play equipment.

POROUS BASKETBALL COURT

The existing basketball court will be replaced with a new court surfaced with porous asphalt. The court will have a subsurface stone bed that is sized to manage runoff from the court, the rooftops of the three houses immediately north of the park, and overflow from the 4th Street planters. The subsurface stone storage bed will connect to a water level control structure that will overflow to the combined sewer and allow the storage bed to be underdrained if infiltration is not feasible.

RAIN GARDEN

The site plan prepared for the City proposes a rain garden and pavilion adjacent to the basketball court. The proposed GSI plan captures runoff from the play surface of the proposed swings, the path along the southern edge of the park, and the parking lot on the public housing property to the southeast of the park and diverts it into the rain garden. Runoff from the play surface of the swings will be directed through sheet flow while a trench drain across the path will divert runoff from the path to the rain garden. Runoff from the parking lot will be diverted through a vegetated swale or pipe. A vegetated swale would require additional grading and excavation. An inlet within the rain

garden will convey overflow to the porous basketball court's stone bed for additional storage. Site constraints limit rain garden storage, and it cannot provide storage for the full 1.4" of runoff from its contributing impervious areas. However, the porous basketball court has been designed to provide additional storage to offset this volume.

STORMWATER SWALE

The park renovation plan proposes a loop pathway around the playground and a rain garden upslope of the playground. In order to minimize runoff and increase stormwater capture, the rain garden was shifted to the downslope side of the playground and extended to function as a bioswale. The path was altered to reduce proposed impervious surfaces and provide opportunities for additional runoff capture. A trench drain directs runoff from the Fulton Street into the bioswale, where it flows adjacent to the path until reaching a ponding area at the downslope of the bioswale. The bioswale will ultimately manage runoff from Fulton Street, the small ADA parking area for the park, the path, and the playground. A domed riser (overflow control structure) at the bottom of the bioswale ties into the existing stormwater drainage infrastructure of the park and will provide a safe path for overflow from the bioswale.

BIOSWALE

A bioswale will be located on the north side of Kelker Street at the intersection with 4th Street to capture right-of-way runoff. While there is an existing grass strip, it is too narrow to provide space for stormwater management. Instead, the proposed design shifts the sidewalk to create adequate space for a surface GSI system. Street runoff is diverted into the bioswale via a curb opening. Storage will be provided at the surface, in the planting media, and in a subsurface stone bed. A tree trench with only subsurface storage could be an alternate scheme that would not require shifting the sidewalk.

<

THE PROJECT WILL MANAGE 35,657 SF OF IMPERVIOUS SURFACES AND IS ESTIMATED TO COST A TOTAL OF $269,500.

THIS IS EQUAL TO MANAGING 31,551 GALLONS OF STORMWATER.

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BIG GREEN BLOCK

The Big Green Block site includes the area bounded by 6th Street, Camp Street, Jefferson Street, and Forrest Street. This project area became a focus not only for the stormwater opportunities, but also because of the potential for partnership with the Camp Curtin neighborhood and YMCA.

GSI opportunities for this area range from subsurface systems focused on maximizing runoff capture to signature design projects that provide neighborhood greening and highly visible demonstrations of stormwater management. The individual GSI opportunities manage runoff from the YMCA, the roof of the Camp Curtin Memorial Mitchell United Methodist Church, and the streets that create the boundary of the analysis area.

YMCA RAIN GARDEN AND STORAGE/ INFILTRATION TRENCH

A rain garden and storage/infiltration trench along the edge of the YMCA parking lot and beneath the playing field along Jefferson street will manage runoff from the parking lot, as well as runoff from Woodbine, Jefferson, Forrest, and 6th Streets. The narrow, linear rain garden manages surface runoff while minimizing encroachment into the playing field. The rain garden will overflow to a subsurface storage/infiltration trench beneath the field that will provide additional storage for parking lot runoff as well as runoff from adjacent streets. New inlets installed upslope of existing sewer-connected inlets connect directly to the trench and divert right-of-way runoff. Diversion of runoff from the sides of Woodbine, Jefferson, and Forrest Streets opposite the YMCA property and from Jefferson Street between Woodbine Street and Wharton Alley will require additional evaluation of existing infrastructure to determine if managing those drainage areas is feasible.

TYPES OF GSI

PERVIOUS PAVEMENT

BIOSWALE

STORMWATER PLANTER

^

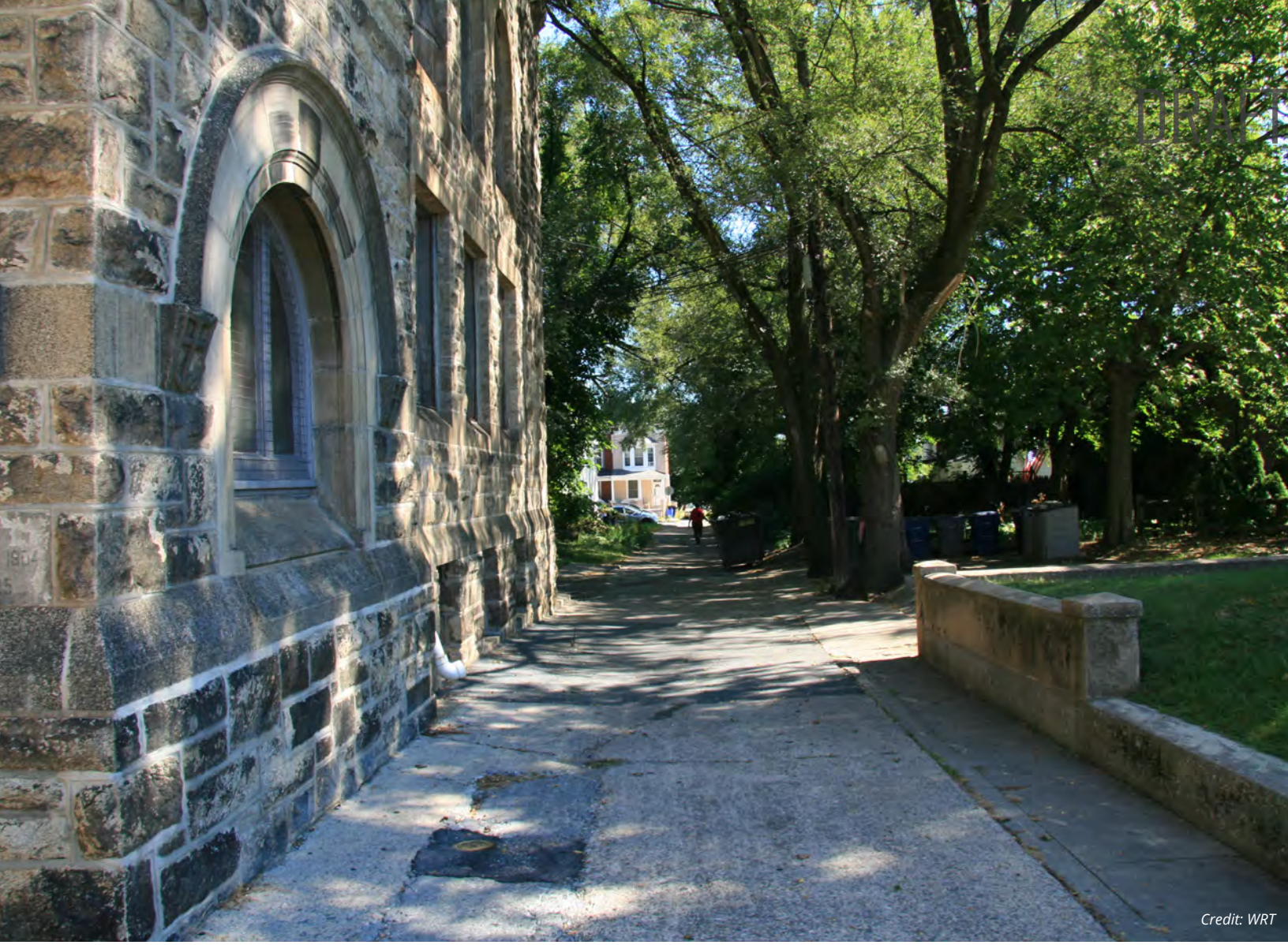
GSI PROJECTS INCLUDE SUBSURFACE AND SURFACE SYSTEMS

A large storage infiltration area under the YMCA playfield, suburface storage under the planters along 6th Street, and the pervious paving on Wharton Alley have large subsurface storage components.

LEGEND

Groups of Drainage Areas (impervious areas) managed by a GSI system

Green Stormwater Infrastructure (GSI) system (i.e., tree trenches, planters, etc.)



Credit: WRT

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CAMP CURTIN MEMORIAL MITCHELL UNITED METHODIST CHURCH & ADJACENT ALLEYWAY

The alleyway, which is proposed to be resurfaced with pervious paving, is located between an historic church and park.

YMCA GREEN WALL WITH FLOW-THROUGH PLANTERS

Two existing roof leaders on the eastern face of the YMCA building will be diverted to green stormwater walls that will overflow to flow-through planter boxes. Each green stormwater wall consists of parallel troughs mounted to the side of the YMCA building that provide both surface and soil storage for runoff coming from the roof. The overflow and under drain from each trough flow to the trough below, and the bottommost trough overflows to a larger flow-through planter box that provides additional surface, soil, and stone storage. The sizing and layout of the troughs is subject to additional structure considerations and analysis. The stormwater planter will be lined and have both an overflow and under drain to safely convey stormwater away from the building. The stormwater benefits provided by this system of troughs and planters include volume reduction through evapotranspiration and increased time of concentration to reduce peak rate.

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CHURCH STORMWATER PLANTERS AND STORAGE/INFILTRATION TRENCH

Stormwater planters along 6th Street and Woodbine Street will collect stormwater runoff from the Woodbine and 6th Street rights-of-way as well as a portion of the runoff from the Governor Curtin memorial at the northeast corner of the intersection. Stormwater is diverted into the planters using trench drains. Each planter provides surface and soil storage for stormwater that flows into the planters. A stone storage/infiltration trench that connects the planters underground will provide additional storage and infiltration area. Runoff from the west side of 6th Street as well as both side of Wharton Alley west of 6th Street that flow onto 6th Street will be captured via inlets and piped directly to the storage/infiltration trench.

<

THE PROJECT WILL MANAGE 2,910 – 134,050 SF OF IMPERVIOUS SURFACES AND IS ESTIMATED TO COST $54,000 – $1.15 MILLION.

THIS IS EQUAL TO MANAGING 106,500 GALLONS OF STORMWATER.

WHARTON ALLEY POROUS PAVEMENT

Wharton alley from 6th Street to Jefferson Street will be repaved with porous asphalt. However, given the proximity of the alley to the adjacent historic church, the depth of excavation in the alley will be limited. Three inches of porous asphalt will be installed over an eight-inch stone bed, a portion of which will need to be lined due to proximity to existing buildings. A storage trench of this depth over the length of the alley provides enough static storage for about 1.24 inches of runoff from the alley and the portions of the church roof that could be diverted to the storage bed. Additional evaluation will be needed to confirm that the proposed excavation depth for the porous asphalt and pipe trenching is advisable adjacent to the church and that the proposed asphalt and subbase are sufficient given the typical traffic in the alley. The stone bed will need to be stepped along the length of the alley to provide a level bottom for infiltration. It may be possible to increase the depth of some of the steps to provide additional storage where there are no existing structures limiting the depth of excavation.

JEFFERSON STREET BIOSWALE

There is currently no sidewalk on the west side of Jefferson Street south of Camp Street. A new sidewalk will be constructed along with a bioswale that manages runoff from Jefferson Street and the new sidewalk. A flush curb or multiple curb openings will allow runoff from Jefferson Street to flow into the bioswale. Bollards or another deterrent may be required to prevent cars from parking in or driving on the bioswale if a flush curb is used. However, that alternative will allow for better capture and management of runoff along the full length of the bioswale.

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SUMMIT TERRACE

The Summit Terrace Neighborhood was evaluated to identify opportunities to implement GSI on vacant lots and corridors identified by the community. Based on that evaluation, proposed GSI in the neighborhood is focused on Walnut Street from Jonestown Street to 13th Street and Bailey Street from 12th Street to 13th Street. Although Summit Street from Bailey Street to Royal Terrace Park was also identified as a priority, it was not considered a favorable corridor for GSI implementation because of space constraints and utility conflicts.

The systems along Walnut Street are primarily within the right-of-way and demonstrate a range of surface and subsurface practices to provide both streetscape enhancement and maximize capture. GSI in this area includes a stormwater plaza with planters, bumpouts, a tree trench, and stormwater trees. The systems along Bailey Street are less intensive systems that manage runoff at the surface in vacant lots while providing pocket gardens and park spaces along the corridor. In addition to four rain gardens that capture street runoff, a tree trench with subsurface storage is proposed adjacent to one of the rain garden to manage runoff from a larger drainage area. Additional street trees are proposed along both corridors wherever feasible. Although street trees do not capture and store surface runoff, the canopy will provide volume reduction and increased time of concentration through evapotranspiration while they reduce urban heat island effect, improve air quality, and enhance the streetscape.

WALNUT STREET STORMWATER PLAZA WITH PLANTERS AT LINDEN STREET

A stormwater plaza at the southeast corner of Walnut Street and Linden Street will provide an attractive gathering space adjacent to the neighborhood's community garden. The plaza area, which is currently used as parking, will be surfaced with permeable concrete pavers and will include three planters and a subsurface storage area. The two planters on Walnut Street will intercept runoff from the south side of Walnut Street from Linden to 13th Street. The planter on Linden Street will intercept runoff from the east side of Linden Street from Shrub Street to Walnut Street. The planters will provide surface and soil storage for stormwater and will be constructed over a larger stone infiltration/storage trench that will provide additional storage. Runoff from the west side of Linden Street and the north side of Walnut Street will be diverted directly into the subsurface storage via new inlets.

TYPES OF GSI

STORMWATER BUMPOUT

RAIN GARDEN

STORMWATER TREE TRENCH

^

A SERIES OF RAIN GARDENS CREATES SMALL NEIGHBORHOOD GATHERING SPACES

Rain gardens on vacant lots on Bailey Street create small neighborhood gathering spaces.

LEGEND

Groups of Drainage Areas (impervious areas) managed by a GSI system

Green Stormwater Infrastructure (GSI) system (i.e., tree trenches, planters, etc.)

Credit: WRT

^
SUMMIT TERRACE COMMUNITY LOT

On the other hand, we denounce with righteous indignation and dislike men who are so beguiled and demoralized by the charms of pleasure. But who has any right to find fault with a man who chooses to enjoy a pleasure that has no annoying consequences.

WALNUT STREET BUMPOUTS

Two stormwater bumpouts along the south side of Walnut Street between Balm and Linden will capture and provide surface, soil and stone storage for runoff from the south side of Walnut Street from Linden Street to Balm Street. A stone storage/infiltration trench in the sidewalk will provide additional storage. Runoff from the north side of Walnut Street will be diverted directly into the trench via a new inlet on the north side of the street.

WALNUT STREET TREE TRENCH

A stormwater tree trench on the south side of Walnut Street will provide subsurface storage for runoff from both sides of Walnut Street that will be diverted to the storage/infiltration trench via new inlets on either side of the street. The trench provides storage and infiltration, or slow release of runoff. Street trees within the trench provide volume removal through evapotranspiration.

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WALNUT STREET STORMWATER TREES

Eight stormwater trees are proposed along the north and south sides of Walnut Street between 12th Street and N. Summit Street. Each tree will manage a drainage area by diverting street runoff through curb opening and providing subsurface storage in the tree pit. Although stormwater trees do not achieve the target storage that most of the other systems provide, they are an alternative to provide some stormwater storage, runoff reduction through interception and evapotranspiration, and streetscape enhancement where utility and other constraints preclude implementation of larger systems.

BAILEY STREET RAIN GARDENS

A rain garden on the south side of Bailey Street in a vacant lot between 12th Street and N Summit Street will manage stormwater from the south side of the street through a curb opening directly into the rain garden. A second rain garden will be located south of Bailey Street in the community-owned space where N Summit Street ends at Bailey Street. A trench drain will divert runoff from the south side of the street across the sidewalk and into the rain garden. A third rain garden will be located on the south side of Bailey Street in a vacant lot where Balm Street ends. Runoff from the south side of Bailey Street will be diverted into the rain garden via a trench drain. Due to some topography and space constraints, additional investigation will need to be competed to determine whether a rain garden of this shape is feasible. The fourth rain garden will be located at the southwest corner of the intersection of Bailey Street and 13th Street. A trench drain will divert runoff from the south side of Bailey Street across the sidewalk and into the rain garden. A tree trench adjacent to the rain garden and stone beneath the rain garden will provide additional storage for runoff. To capture additional street runoff, a new inlet will be installed on the north west corner of the intersection of Bailey Street and 13th Street. Additional runoff will be captured from the high point of Shrub Street between 13th and Linden Streets flowing towards Linden Street, Linden Street between Shrub Street and Bailey Street, and the north side of Bailey Street between Linden Street and 13th Street. The new inlet will connect to a subsurface tree trench with three feet of gravel for subsurface storage. One tree is added in the tree trench system and a new sidewalk is proposed for the area as the existing sidewalk is in disrepair. Additionally, four street trees are proposed along the north and south side of Bailey Street.

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THE PROJECT WILL MANAGE 3,630 – 61,170 SF OF IMPERVIOUS SURFACES AND IS ESTIMATED TO COST A TOTAL OF $10,300 – $441,100.

THIS IS EQUAL TO MANAGING 53,942 GALLONS OF STORMWATER.

Credit: Flickr // Chesapeake Bay Program

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THE PROGRAM

There is standard for green stormwater infrastructure programs — they range from programs that build GSI on public property to programs that provide incentives for residents to construct GSI on private properties. In fact, cities often employ a combination of strategies, including improvements to grey infrastructure, to create a successful stormwater management program.

Harrisburg needs a mixture of grey and green infrastructure to manage its stormwater. Capital Region Water is committed to creating a green stormwater infrastructure program that prioritizes investment in green technologies to manage stormwater and leverages infrastructure investment to provide benefits to Harrisburg communities. However, the stormwater management program will need to include some investment to update and repair the current grey infrastructure system. The balance of green and grey will be based on the analysis and modeling results from the upcoming Long Term Control Plan.

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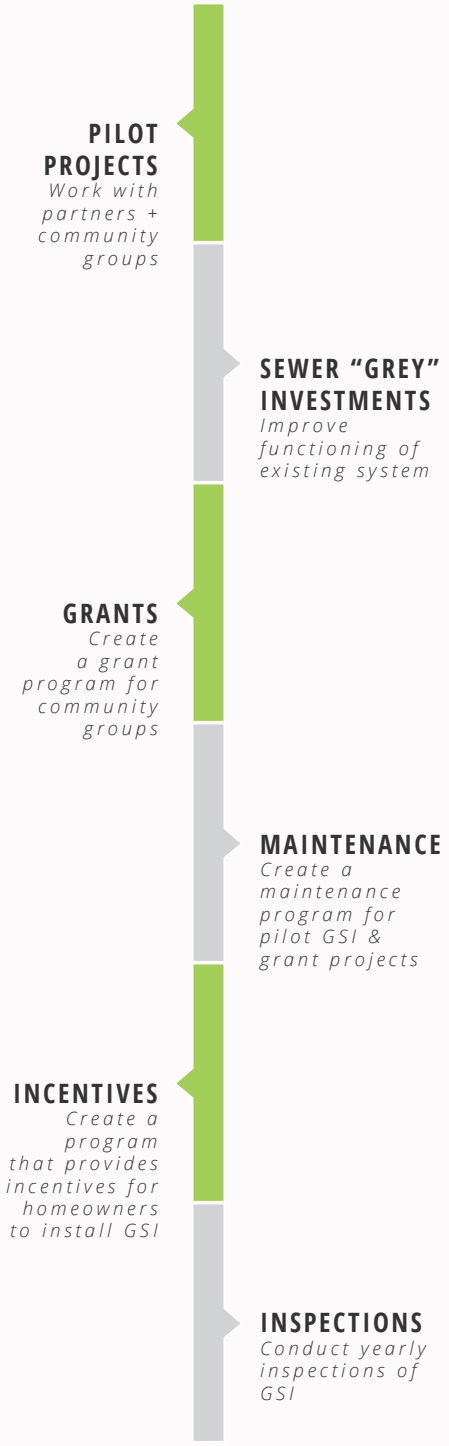
POTENTIAL PROGRAM OUTLINE



HOW SHOULD WE INVEST?

PROGRAM OUTLINE

Successful stormwater management programs include a healthy mix of investment in maintaining existing sewer and wastewater infrastructure and funding for green infrastructure projects. The program to manage stormwater in Harrisburg will include funding for pilot green stormwater infrastructure projects, investments in existing sewer infrastructure, grants and incentives for community groups and homeowners, and maintenance and inspection programs.

Building GSI in the public realm (schools, parks, streets, etc.) will involve Capital Region Water working with partner organizations and neighborhood partners from design through construction. This program would likely be funded through a mixture of Capital Region Water's capital and operating budgets, which are funded through utility fees, a potential new fee, and grants from state and federal organizations, including the EPA Clean Water State Revolving Fund. Public-private partnerships can reduce Capital Region Water's costs of building GSI.

Providing grants and incentives for community groups or residents to construct GSI would give organizations and residents an opportunity to apply for funding from Capital Region Water to build GSI. Programs throughout the country handle these incentive/grant programs in different ways, but there are three basic models — cost-sharing, rebates, and grants. Cost-sharing programs, like the RainCheck program in Philadelphia, share the upfront cost of building GSI with the community organization or resident. Rebate programs, similar to the RainWise program in Seattle, provide the community organization or resident with a rebate after the GSI is installed and inspected. Grant programs, like the Watershed Stewards Grant in San Francisco, issue grants to community organizations or neighbors who work together to propose a GSI project in their neighborhood.

In order to make a GSI program work there must be a system in place to ensure that installed systems are properly maintained and inspected. If GSI is not properly maintained, it may cease to function, negating its environmental, social, and economic benefits. Cities with established programs have employed different methods to address maintenance. The RiverSmart program in Washington, D.C. builds inspections into incentive or program agreements. Seattle's RainWise program requires owners to sign an agreement to maintain the GSI for at least five years. In order for Capital Region Water's program to be successful, a clear maintenance and inspection program and schedule must be included in program agreements and guidelines.

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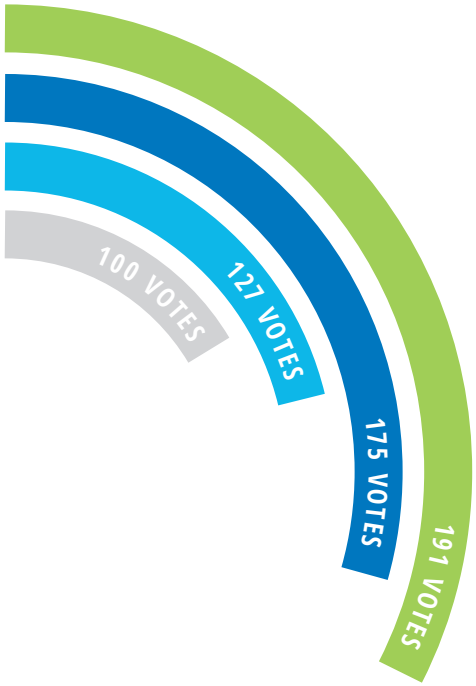
IF YOU HAD $500 TO SOLVE OUR PROBLEM:

Build GSI in the public realm (schools, parks, streets, etc.) **01**

Provide grants/incentives for community groups to build GSI **02**

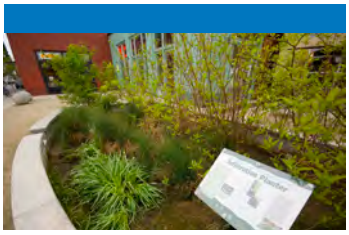
Provide grants/incentives to individuals for GSI retrofits **03**

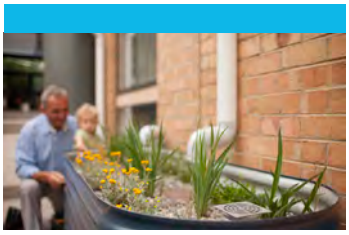
Enhance grey infrastructure/ build bigger sewers **04**

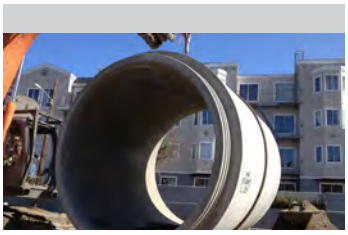


< WE ASKED, YOU ANSWERED!

The voting results of the "money game" include participants at the first series of public meetings at the Camp Curtin YMCA and the Lancaster School.







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Credit: Flickr // Port of Tacoma

THE MAGNITUDE OF THE PROGRAM

LEVERAGING PARTNERSHIPS

Capital Region Water cannot do this alone. Tackling the issue of stormwater management will require participation from local and state government agencies, community organizations, neighborhoods, and other partners. Capital Region Water plans to leverage funding with partners throughout Harrisburg who have goals that can be furthered by green stormwater infrastructure in an effort to find ways to capitalize on the multiple benefits of green infrastructure.

Capital Region Water plans to not only partner with community organizations, non-profits, and government agencies, but also with individual property owners. The majority of land in the city is privately owned. This means that while the initial phases of green infrastructure will focus on public property, where the city has control, Capital Region Water will need to work with private owners to strategize ways to implement green stormwater infrastructure on private property.

HOW MUCH WILL IT ALL COST?

The three pilot projects — 4th and Dauphin Park, Big Green Block, and Summit Terrace provide some guidance about the potential cost of implementing GSI in Harrisburg. There may be ways to share costs by creating partnerships. The average cost per acre managed for the pilot projects is $405,500, or $289,000 per acre-inch managed. Pilot projects are typically more expensive because they have not reached an economy of scale. For purposes of comparison, Philadelphia Water targets an average of $250,000 - $300,000 per acre-inch managed.

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GSI BUDGET

< IMPLEMENTATION & MAINTENANCE, WORKFORCE DEVELOPMENT & GSI PLANNING / DESIGN WILL GENERATE JOBS

In order to fully implement the plan, we will need skilled laborers, engineers, architects, landscape architects, technicians, environmental scientists, educators, community outreach coordinators.

"Everyone can do something, and if we all do something, before we know it the job will be done and we will have impacted a generation. Not just this generation but generations to come." **– Bishop Roberta Thomas**